



**LAWRENCE BERKELEY
NATIONAL LABORATORY**

**ENVIRONMENT, SAFETY, AND
HEALTH
SELF-ASSESSMENT REPORT
FISCAL YEAR 2009**

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I. Introduction

The Lawrence Berkeley National Laboratory (LBNL) Environment, Safety, and Health (ES&H) Self-Assessment Program ensures that Integrated Safety Management (ISM) is implemented institutionally and by all divisions. The Self-Assessment Program, managed by the Office of Contract Assurance (OCA), provides for an internal evaluation of all ES&H programs and systems at LBNL. The primary objective of the program is to ensure that work is conducted safely and with minimal negative impact to workers, the public, and the environment.

The Self-Assessment Program is also the mechanism used to institute continuous improvements to the Laboratory's ES&H programs. The program is described in LBNL/PUB-5344, Environment, Safety, and Health Self-Assessment Program, and is composed of four distinct types of self-assessments: Division Self-Assessment, ES&H Technical Assurance Program assessment, ES&H Peer Review, and the Appendix B Performance Evaluation and Management Plan. In fiscal year (FY) 2009, Health, Safety, and Security (HSS) Emulation Walkaround Reviews were conducted in lieu of Peer Reviews.

The Division Self-Assessment uses the five core functions and seven guiding principles of ISM as the basis of evaluation. Measures are created to assess performance in fulfilling ISM core functions and guiding principles.

The five core functions of ISM are:

1. Define the Scope of Work.
2. Identify and Analyze Hazards.
3. Control the Hazards.
4. Perform the Work.
5. Feedback and Improvement.

The seven guiding principles of ISM are:

1. Line Management Responsibility for ES&H.
2. Clear Roles and Responsibilities.
3. Competence Commensurate with Responsibilities.
4. Balanced Priorities.
5. Identification of ES&H Standards and Requirements.
6. Hazard Controls Tailored to the Work Performed.
7. Operations Authorization.

Performance measures are developed by consensus among representatives from each division: Environment, Health, and Safety (EH&S) Division program managers and

OCA. Line management of each division performs the Division Self-Assessment annually. The primary focus of the review is workplace safety.

The ES&H Technical Assurance Program (TAP) provides the framework for systematic reviews of ES&H programs and processes. The intent of ES&H Technical Assurance assessments is to provide assurance that ES&H programs and processes comply with their guiding regulations, are effective, and are properly implemented by LBNL divisions.

The Appendix B Performance Evaluation and Measurement Plan (PEMP) requires that LBNL sustain and enhance the effectiveness of integrated safety, health, and environmental protection through a strong and well-deployed system. Information required for Appendix B is provided by EH&S Division functional managers. The annual Appendix B report is submitted at the close of the fiscal year. This assessment is the Department of Energy's (DOE's) primary mechanism for evaluating LBNL's contract performance in ISM.

The HSS Emulation Walkaround Reviews were conducted in LBNL divisions not engaged by the HSS Inspection. The intent was to gauge the understanding of Laboratory personnel regarding key elements of the ISM process and to provide written feedback to division management regarding the status of their workplace safety programs.

This report includes the results of the Division Self-Assessment, ES&H TAP, and Appendix B PEMP processes. Also contained within the report are the findings of the HSS Walkaround Emulation Review, described in Section III.

II. ES&H Improvements

Each year, as a result of the annual ES&H self-assessment process, LBNL identifies institutional issues that require management action. Actions completed to address opportunities for improvement identified in the FY 2008 ES&H Self-Assessment Report include:

- The Job Hazards Analysis (JHA) and the Remedy Interactive ergonomics databases were linked to prompt and track ergonomics training for targeted populations. Ergonomics Advocates are now provided access to the ergonomics database for their respective divisions.
- Crane managers are now identified.
- To meet PUB-3000 Chapter 6 requirements, LBNL's Laser Safety Officer (LSO) modified the laser Temporary Work Authorization form to require the signature of the Division Director (or designee) in addition to those of the LSO and the Principle Investigator.
- As a result of 2008 DOE Laser Safety audit, the LBNL Laser Safety Program was granted the status of Authority Having Jurisdiction for purposes of review and approval of deviations from ANSI Z136.1-2000.
- The LSO now inspects the eight laser-interlock systems in use at LBNL to ensure that they meet life safety code requirements.
- The training database was updated to reflect 10CFR851 and Occupational Safety and Health Administration (OSHA) requirements for annual lead worker training.
- Facilities now conducts and records all pre-use inspections of Powered Industrial Trucks (PITs) located at the LBNL warehouse in Richmond.
- All operators are now required to have current licenses prior to operating PITs.
- Quality Assurance requirements for internal dose calculation software validation and verification and internal dose calculation independent review were revised to include internal dose calculation spreadsheets.

The status of all institutional issues identified in the FY 2008 ES&H *Self-Assessment Report* are described in Appendix A, Status of FY 2008 Self-Assessment Institutional Opportunities for Improvement.

LBNL completed preparation of the Corrective Action Plan (CAP) in June 2009 in response to the DOE Office of Health, Safety, and Security (HSS) Independent Oversight Inspection conducted during January and February 2009. The HSS CAP describes the actions that LBNL will take to improve the quality of ES&H programs, assist line management in exercising safety responsibilities in an efficient and effective manner, and meet management commitments to DOE. The DOE Office of Science approved the

LBNL HSS CAP on June 25, 2009. The HSS CAP is composed of 12 findings (10 HSS findings and two LBNL self-identified common-cause findings), and each finding contains a number of specific actions intended to improve Integrated Safety Management, enhance the safety culture, and reduce the risk of accidents and injuries at LBNL.

During the latter stages of FY 2009, HSS CAP completed actions were by and large a precursor to more significant pending items linked to program implementation. These pending items scheduled for completion in FY 2010 include:

- Piloting of an interim management system to ensure ES&H programs are designed or significantly revised more effectively.
- Creating a final ES&H management system based on the results of the pilot.
- Developing recommendations to Senior Laboratory Management to improve the existing JHA (Work Planning and Control) process, along with a plan to implement these recommendations.
- Developing a work authorization process addressing potential exposure to hazardous electrical energy, and revising current Lock Out/Tag Out (LOTO) and electrical safety training.
- Clarifying safety roles, responsibilities, and expectations along with publication of safety accountability mechanisms.
- Reinforcing the importance of robust division self-assessment programs, updated self-assessment guidance, and improved training for personnel performing ES&H self-assessments.

III. Division ES&H Self-Assessments and HSS Walkaround Emulation Reviews

This section describes the results of the Division ES&H Self-Assessment and LBNL Health, Safety, and Security (HSS) Walkaround Emulation Review processes.

Divisions track division-specific deficiencies identified from these reviews until they are resolved. This report addresses institutional issues and issues present in multiple divisions where performance indicates recurrent inadequacies in implementation and/or programmatic weaknesses.

Also included in this report are the results of a series of formal walkarounds and related activities done to gauge the understanding of Laboratory personnel regarding key elements of the Integrated Safety Management (ISM) process. These reviews were conducted in Laboratory organizations that were not engaged as part of the HSS review.

Results for the Division ES&H Self-Assessments and LBNL HSS Walkaround Emulation Review processes are reported by ISM core function as:

- Findings: Program or performance deficiencies, nonconformances, regulatory or procedural noncompliances, procedure inadequacies, assessment findings, external oversight findings, and associated actions that require formal corrective action.
- Noteworthy Practices: A technique or methodology that, through experience and research, has proved to reliably lead to a desired result. It might also be a recommendation, suggested process improvement, or management or division initiative.

A consolidated list of institutional findings is located in Appendix B, FY 2009 Self-Assessment Institutional Findings. Appendix C, FY 2009 Self-Assessment Divisional Noteworthy Practices, includes a comprehensive list of best practices identified from these assessments.

Division Self-Assessments

Divisions use the current Self-Assessment Program performance criteria to evaluate their work activities, workplaces, and operations for conformance to safe practices and environmental stewardship. Self-assessment activities include ongoing inspections, informal walkthroughs, hazard reviews, interviews with managers and staff, and review of ES&H performance indicators. At the end of the performance year, each division prepares a report that summarizes these activities and appraises its ES&H performance. The Office of Contract Assurance reviews these reports and conducts a validation session with division and DOE representatives. The validation is performed to provide feedback

on the comprehensiveness of the divisions' self-assessment processes and to identify opportunities for improvement and noteworthy practices in these processes.

FY 2009 was the third year since LBNL transitioned from the previous criteria-focused model of assessment to a more comprehensive approach. Most divisions performed a more comprehensive self-assessment in FY 2009 as compared with FY 2008. Overall, the FY 2009 ES&H Division Self-Assessment Reports included a greater level of analysis than did the FY 2008 reports. However, much room for improvement remains. Each division director received a validation report that included opportunities for improving the division's self-assessment processes.

HSS Walkaround Emulation Reviews

In response to the Department of Energy (DOE) Office of Health, Safety & Security (HSS) Inspection, LBNL conducted a series of formal walkarounds and related activities in Laboratory divisions not engaged by the HSS inspection. The objective was to gauge the understanding of Laboratory personnel regarding key elements of the ISM process.

Locations and dates of the HSS Walkaround Emulation Reviews were as follows:

<u>Division</u>	<u>HSS Walkaround Emulation Dates</u>
Accelerator and Fusion Research Division	May 2009
Environmental Energy Technologies Division	May 2009
Physics Division	May 2009
Nuclear Sciences Division	May 2009
Earth Sciences Division	May 2009
Genomics Division	June 2009
Materials Sciences Division	June 2009

Performance Results

ISM Core Function 1: Define Work

Divisions describe their processes for sustaining the five core functions of ISM in division-specific ISM plans. Most divisions updated their ISM plans to reflect substantive policy changes made during the performance year, including the new Job Hazards Analysis (JHA) process and designation of work leads. Divisions also considered the *Institutional ISM Plan*, last revised September 2007, in updating their division-specific plans. Divisions communicated the content of their plans via all-hands meetings, group meetings, and division Web sites. Some divisions included staff awareness of their ISM plans on self-assessment checklists and assessed effectiveness of communication during safety walkarounds. The Division Self-Assessment and the HSS Walkaround Emulation

Reviews identified the need to improve awareness of ISM, division ISM plans, and how the division plan applies to employees' work.

Divisions ensure that each worker has a current (reviewed/reauthorized within the previous 12 months) Individual Baseline JHA that accurately reflects the work performed and hazards present. LBNL achieved an overall JHA completion rate of 97% as of September 30, 2009.

A major FY 2009 initiative for LBNL was the implementation of the Subcontractor Job Hazards Analysis and Work Authorization (SJHAWA) program. The SJHAWA process ensures that prejob documentation and meetings are completed prior to initiation of nonconstruction work by subcontractors, vendors, or guests at LBNL facilities. Oversight of the work is performed and recorded using a risk-based graded approach.

FINDINGS

Finding 1-1. In some instances, equipment purchased through LBNL Procurement created safety issues. Specific concerns include:

- Electrical equipment purchased through Procurement does not always meet Nationally Recognized Testing Laboratories (NRTL) requirements.
- LBNL Procurement may not be aware of procured items that create hazards due to poor manufacturing. One example was an unstable server lift extension used by the Information Technology (IT) Division.

Finding 1-2. An update to the *Institutional ISM Plan* was drafted, but was not finalized and implemented. Consequently, the guidance provided to divisions to update their divisional plans was in draft form and never finalized. Therefore, divisions were not properly instructed on when to update their plans or what to include in the updates (e.g. new policy).

Finding 1-3. Clear and formalized institutional expectations regarding ongoing oversight of employees during on-the-job training was not provided. Also, clear and formalized expectations for the "competency expectations" to be demonstrated were not consistently evident. This was especially true when a JHA was the governing work authorization document.

Finding 1-4. In several of the areas visited, the work required movement of large pieces of equipment and/or storage of material at heights. There was neither a consistent approach to moving such equipment and materials, nor evidence that training had been provided.

Finding 1-5. Ownership of the management and the responsibility for assurance of safety of filling stations for dewars was unclear. Local organizations appeared to be taking on activities that might normally be viewed as a maintenance function of the Facilities Division.

Finding 1-6. There did not appear to be an overarching set of institutional expectations regarding the conditions under which personnel should be working alone.

NOTEWORTHY PRACTICES

Noteworthy practices under Define Work include:

- A review process that screens proposals for scientific importance, feasibility, and ES&H concerns prior to approval.
- Verification by Principle Investigators that work has not changed significantly prior to reauthorization of Activity Hazard Documents (AHDs) and Biological Use Authorizations (BUAs).
- A master facility-based document listing locations, responsible persons, formal authorizations, hazard summaries, and primary issue summaries.
- Notification of ES&H manager by division scientists prior to purchase of equipment that may introduce hazards or a new scale of an existing hazard.

ISM Core Function 2: Identify and Analyze Hazards

Divisions identify and analyze hazards by reviewing work activities and inspecting workspaces and operations. The new activity-based JHA process involves analyzing the work, determining what the hazardous tasks are, and defining the controls required to mitigate the hazards. The worker and his/her work lead achieve agreement before the work is authorized. Following initial implementation, some divisions identified the need to improve supervisors' and staff understanding of the process.

Most divisions documented the hazards and environmental impacts inherent in their work in the institutional Hazard Management System (HMS) database¹, though some reported poor performance in this area. Division Self-Assessments and Technical Assurance Program (TAP) assessments of the chemical inventory process identified less-than-adequate performance in maintaining an accurate inventory.

LBNL staff demonstrated awareness of the environmental impacts of their activities and sought ways to reduce those impacts. Divisions conducted environmental performance reviews for selected new and existing work, and some completed an Environmental Review and Self-Assessment Checklist to guide their assessment activities in this area. All divisions continued efforts to reduce paper use, recycle commonly used items, and purchase Energy Star and recycled-content products.

Divisions reviewed work activities to identify, analyze, and categorize hazards and environmental impacts for the associated work. Examples of hazard inventory include:

¹ HMS is a hub for EH&S databases that queries 10 hazard, equipment, and authorization systems to produce a comprehensive *EH&S Summary Report*.

the HMS database, project safety review, workspace safety review, JHAs, environmental review (National Environmental Policy Act [NEPA]/California Environmental Quality Act [CEQA] permits, regulations), and chemical inventory.

A major FY 2009 initiative for LBNL was a comprehensive survey of electrical equipment Laboratory-wide to determine the extent of use of electrical equipment not NRTL listed.

FINDINGS

Finding 2-1. Current JHAs did not fully identify the hazards associated with the work to be performed nor did they consistently contain the Work Group Description of Work for the appropriate work group. Specific concerns include:

- Current JHAs do not fully identify the hazards associated with the work. The complete identification of hazards arising from chemical use requires the further development of an Exposure Assessment program.
- JHA profiles do not consistently contain the Work Group Description of Work for the appropriate work group.

Finding 2-2. Safety walkarounds are not being performed as required in division ISM plans. Deficiencies include not performing per required frequency and not documenting as required.

Finding 2-3. Hazards are not documented as required, as use of the HMS is inconsistent.

Finding 2-4. The relative safety oversight roles and responsibilities of the area safety lead and work lead functions were not consistently understood. This represents a vulnerability when the Principal Investigator (PI) is not consistently resident in the laboratory or has not assured that the work lead has been vested with and can demonstrate responsibility for monitoring work, assuring work is performed consistent with the authorization process, and recognizing and communicating any changes in hazard profile to the PI.

Finding 2-5. With one exception, a traceable and rigorous process for systematically evaluating hazards and applying controls for unsupervised off-site (i.e., outside) projects has not been implemented.

NOTEWORTHY PRACTICES

A noteworthy practice under Identify and Analyze Hazards included:

- Required completion of a Project Hazard Guide by PIs when Field Work Proposals or Formal Requests for Funding Proposals are submitted for review.

ISM Core Function 3: Control Hazards

Divisions administratively control work through line-management, formal, and facility-based authorizations. The JHA process provides uniformity in how line-management authorization is applied at LBNL. Formal authorizations are issued by the EH&S Division and include AHDs, Radiological Work Authorizations (RWAs), BUAs, Confined Space Permits, and Hot Work Permits. Facility-based authorizations include Safety Analysis Documents and environmental permits.

Divisions assessed their facilities and operations to ensure that appropriate engineering controls are in place and maintained. Mandatory use of Personal Protective Equipment (PPE) is implemented in laboratory areas where work having the potential to create eye hazards is performed.

Divisions continued to focus effort and resources to identify and control ergonomic hazards. EH&S and the divisions improved their ability to identify employees with high-risk factors before an injury occurs through the introduction of a Web-based employee ergonomic self-assessment and training program, implementing the ergonomic advocate program, and enhancing communications and awareness of safety to encourage employees to report injuries earlier.

FINDINGS

Finding 3-1. The AHD development process is not efficient due to database limitations and availability of EH&S staff. Specific concerns include:

- Division PIs and safety leaders are unclear on how to properly implement the AHD process due to difficulties in using the AHD database. Particular database issues include difficulties with training information, employee records, and course listings.
- Maintenance of AHDs is susceptible to database usability problems and availability of support from EH&S subject matter experts.
- The time required to authorize and maintain AHDs is dependent on the availability of EH&S Division reviewers. For example, three pending AHDs have been out for review for 1.5, 2, and 6 months, respectively.

Finding 3-2. Development of the AHD system addressing electrical hazards was not completed during FY 2009. This resulted in several instances of unfinished Electrical AHDs for work involving exposures to more than 50 volts and 5 milliamps. Current authorizations to work with electrical equipment are general in nature and based on a description of work in an employee's JHA.

Finding 3-3. Highly symptomatic individuals and subgroups of at-risk employees with prior ergonomic evaluations for discomfort exchanged their desks and chairs for new laboratory standard furniture. This furniture was not properly fitted for all employees, and

three such cases became classified as recordable injuries. In addition, there were other problems with older furniture that didn't fit or function well in new spaces allocated for them.

Finding 3-4. Training courses were not consistently offered with sufficient frequency to support operational demands. Examples include:

- Though LBNL line managers are required to complete EHS0027, *Performing an Effective Safety Walkaround*, the course was suspended during FY 2009. Therefore, divisions couldn't comply with this requirement.
- LBNL does not offer training for fire extinguisher use and bloodborne pathogen training at a periodicity or class size to ensure timely completion of training.

Finding 3-5. Chemicals are not managed as required. Specifically:

- The Chemical Management System is not used as required.
- Chemical ownership and line-management responsibility for chemical management/maintaining inventories have not been resolved.
- Management of peroxidizable chemicals in UC Berkeley laboratories is inconsistent.

NOTEWORTHY PRACTICES

Noteworthy practices under Control Hazards include:

- Development of a Web-based confined-space work briefing.
- Annual testing of peroxide levels in all potential peroxide formers.

ISM Core Function 4: Perform Work

Divisions assess their activities to determine if work is performed within ES&H conditions and requirements specified by LBNL policies and procedures. Elements assessed include formal work authorization and hazardous work permit compliance, environmental compliance (including waste management), required training completion, and accident and injury data.

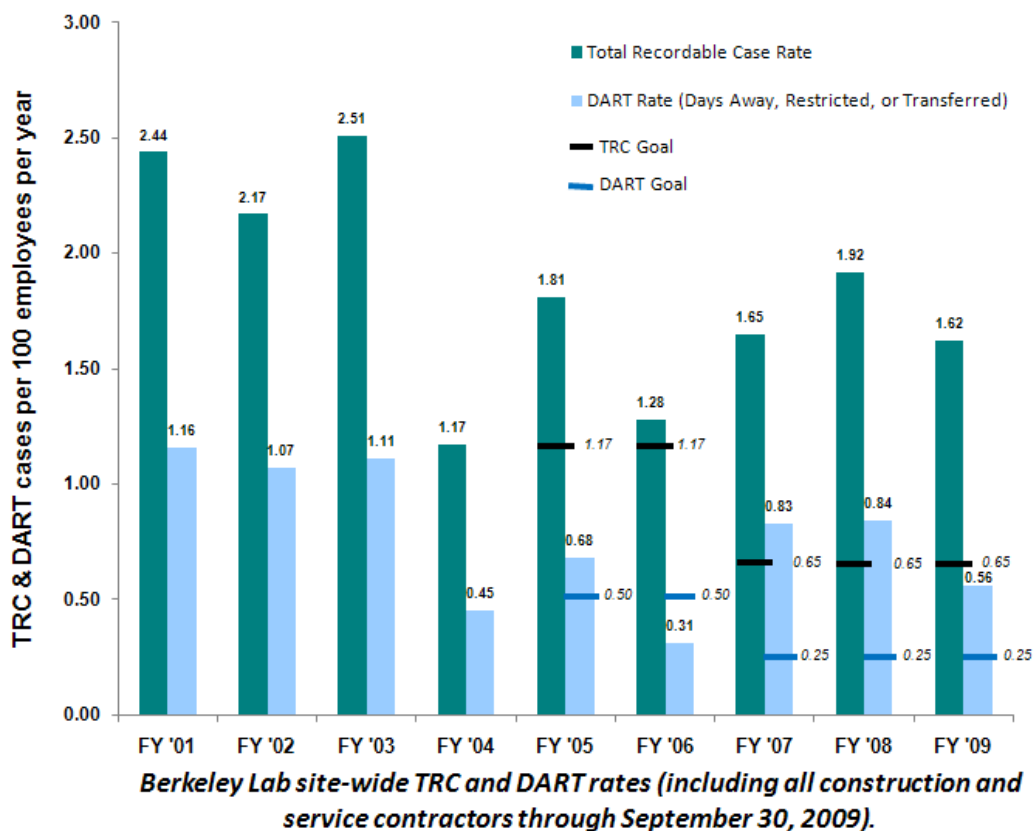
Through their self-assessment activities, some divisions noted fully compliant Satellite Accumulation Areas (SAAs), while others determined that their performance was unsatisfactory. EH&S Waste Management Group Technical Assurance assessments of 399 waste storage areas during FY 2009 determined a compliance rate of 78% compared with the FY 2008 compliance rate of 83%.

The Radiation Protection Group (RPG) issued four Level 2 (major) violations in FY 2009, as compared with eight Level 2 violations in FY 2008. RPG issued no Level 3 (safety significant) violations in FY 2009. Divisions responded to RPG's noncompliance

memos and tracked their issues and corrective actions in the Corrective Action Tracking System (CATS).

LBNL achieved a 94% ES&H training completion rate (an improvement over the FY 2008 rate of 92%). Several enhancements were completed, including development and implementation of an automatic e-mail system that notifies staff and their work leads/supervisors regarding required training. This led to maintaining a higher training completion rate throughout the entire year with less need for direct management involvement near the end of the fiscal year, as had been the case in previous years. This is a notable accomplishment, given the number of additional courses required as a result of the newly implemented JHA process.

The FY 2009 Laboratory-wide total recordable case (TRC) rate is 1.62, a decrease from the FY 2008 TRC rate of 1.75 (see chart below). In response to rising illness and injury case rates, LBNL continued its aggressive program to reduce the number and severity of injuries, with particular attention to musculoskeletal injuries, which represented 75% of injuries in FY 2009. Repetitive motion (ergonomics) cases represented 31% of the FY 2009 injuries.



FINDING

Finding 4-1. Compliance with SAA program requirements is inconsistent.

- SAA noncompliances are prevalent, such as unlabeled bottles and debris in SAA trays.
- In some instances, waste is left by departing groups or individual researchers without proper characterization.

NOTEWORTHY PRACTICES

Noteworthy practices under Perform Work include:

- Meetings between program heads and program staff to discuss requirements for supervising guest scientists and visitors.
- Withholding of badges from new hires and guests pending completion of JHAs and General Employee Radiological Training (GERT) training.

ISM Core Function 5: Feedback and Improvement

Senior management in all divisions is involved in ES&H feedback and improvement. Divisions have established extensive communication networks in the form of division-wide meetings and e-mail distribution, senior leadership ES&H forums, safety committees and subcommittees, newsletters, Web pages, etc. Some divisions prepare and review quarterly management briefings on topics such as accidents/incidents, training/JHA completion, ergonomic evaluations, and corrective actions to address ES&H deficiencies.

During the performance period, divisions continued to implement and improve their safety walkaround programs. They focused on improving walkaround quality and their ability to identify technical issues such as electrical hazards, in addition to administrative issues such as signage. Some divisions also performed risk-based assessments of predominant hazards, such as biosafety and chemical management.

Divisions investigated adverse ES&H conditions reported in the DOE Occurrence Reporting and Processing System (ORPS), Noncompliance Tracking System Reports, and Supervisor Accident Analysis Reports (SAARs). Some divisions improved the level of analysis they perform. Notable examples include 1) an analysis of several events that identified weakness in implementing ISM Core Function 1, Define Work and 2) a thorough investigation and analysis of an RWA violation that resulted in multiple process improvements.

Some divisions have developed near-hit reporting systems and, in some cases, offer incentives for near-hit reports to encourage employees to share adverse experiences. However, this information is typically not broadly disseminated outside the source division.

In general, divisions are effectively tracking and resolving safety deficiencies. Some, however, identified less-than-adequate use of CATS.

FINDINGS

Finding 5-1. LBNL did not provide adequate guidance to divisions to evaluate compliance with applicable environmental permit requirements.

Finding 5-2. Divisions are not tracking safety findings as required. Specifically:

- Not all applicable findings are being entered into CATS, especially findings from safety walkarounds.
- Timeliness of entering items into CATS also needs improvement, as some findings are not entered into CATS within five days of discovery.

Finding 5-3. Supervisor Accident Analysis Reports (SAARs) are not consistently completed as required.

- SAARs are not always completed within the seven-day time requirement.
- Some older SAARs have not been released as required.

NOTEWORTHY PRACTICES

Noteworthy practices under Feedback and Improvement include:

- A “Bio-scientists Observing Bio-scientists” program that applies the principles of behavior observation and positive feedback.
- Triannual inspections of SAAs by division, EH&S Division, and Berkeley Site Office representatives.
- An inspection log of division laboratories, which is used to document monthly walkthroughs.
- Walkthroughs and observation of work behavior by division management, program heads, and supervisors.
- Benchmarking current user-safety systems, identification of common issues, and identification of best practices.
- Recording and analyzing near-hits in order to strengthen feedback and improvement and identify possible patterns in safety risks and deficiencies.
- Creating a Division Zero Accident Council designed to engage staff in sharing and examining safety and health issues.
- Implementing a Vertical Slice Questionnaire, used to periodically gauge the knowledge and attitude toward safety within the division.

IV. ES&H Technical Assurance Program (TAP)

The ES&H Technical Assurance Program (TAP) provides the framework for systematic reviews of ES&H programs and processes. The intent of ES&H Technical Assurance assessments is to provide assurance that ES&H programs and processes comply with their guiding regulations, are effective, and are properly implemented by LBNL divisions.

The Office of Contract Assurance works with EH&S Division representatives to establish and maintain a three-year ES&H Technical Assurance assessment schedule. Review periodicity varies, depending on programs' and processes' hazards and risk levels. Program leads develop Technical Assurance Assessment Plans (TAAPs) and conduct assessments according to the TAAPs.

ES&H Technical Assurance assessments include regular inspections of the workplace, work activities, and facilities. Assessments also include reviews of documentation such as formal work authorizations, hazardous work permits, and EH&S and Corrective Action Tracking System (CATS) databases. The primary elements of ES&H Technical Assurance assessments are:

- Formal authorization compliance
- Regulatory compliance
- Program or process effectiveness
- Issues documentation (via the CATS database) and timely resolution
- Corrective action effectiveness (implemented via data monitoring and analysis)
- Lessons Learned effectiveness

Systematic assessments of the technical programs and processes provide a basis for EH&S and other divisions to direct resources for improved ES&H performance.

Performance Results

The EH&S Division implemented an ES&H TAP for 24 subject areas in FY 2008 and expanded the program to 40 subject areas in FY 2009. The TAP subject areas added in FY 2009 were:

- Accelerator Safety
- Aerial Lift
- Beryllium
- Cranes and Hoists

- DOE Laboratory Accreditation Program (DOELAP)
- Emergency Eyewash/Shower
- Environmental Management System
- Fixed Treatment Units
- Lock Out/Tag Out (LOTO)
- Machine Guarding and Shop Safety
- Material Control and Accountability
- Nonconstruction Safety Assurance
- Nuclear Safety Management (Inventory)
- Personal Protective Equipment
- Radioactive Material Transportation
- Ventilation
- Air Quality ¹
- Disability Management ¹
- Environmental Restoration ¹
- Occupational Medicine ¹
- Preplacement Physicals ¹
- Storm Water Quality ¹
- Underground and Aboveground Storage Tanks ¹

¹ Subject area not formally included in the LBNL Technical Assurance Program but subject to comparable review.

This report provides a description of each program assessed, including, where applicable, programmatic findings and/or noteworthy practices. Division implementation deficiencies are communicated at the time of assessments and tracked through resolution by the divisions, whereas any programmatic findings are tracked by the EH&S Division and included in this report.

Accelerator Safety

The Accelerator Safety Program establishes policies and/or procedures that help assure compliance with DOE Order 420.2B (Safety and Accelerator Facilities) requiring that workers remain safe from accelerator and radiological hazards. During FY 2009, all devices at LBNL that might be considered accelerators were compiled. In addition, the level of compliance with EH&S Procedures 707 (Radiological Work Authorization Program) and 703 (Institutional Assurance of Accelerator Safety Order Compliance) were evaluated.

TAP Finding 1. Institutional Unresolved Safety Issue (USI) procedures have not been promulgated at all LBNL accelerator facilities.

Aerial Lift

The Aerial Lift Program establishes policies and/or procedures that help assure the safe use of aerial lift equipment by properly trained and certified operators. All training, operation, maintenance, documentation, and inspection must meet industry standards and best practices, and must comply with ANSI/SIA, OSHA, LBNL, DOE, and General Industry Safety Orders.

TAP Finding 2. The Job Hazards Analysis (JHA) system does not currently include aerial lifts, and affected workgroups must manually address hazards and controls. While this could be compliant, the ad-hoc supervisor JHA input has been documented to leave out the requirement for *Fall Protection Training* (EHS0276) in conjunction with aerial lift operations.

Air Quality

The Air Quality Program establishes policies and/or procedures that help assure inspection of sources and monitoring of various potential air contaminants throughout LBNL. All 28 sources permitted by the Bay Area Air Quality Management District were inspected. All source records were reviewed and found to be compliant with permit conditions. The meteorological monitoring system was also assessed and found to be properly maintained, with calibration audits properly documented and performed on schedule.

TAP Finding 3. Log sheets for two emergency generators showed run times exceeding allowable permit conditions.

Asbestos

The Asbestos Management Program establishes policies and/or procedures that help assure that work controls are integrated into the design phase of projects to help plan work activities, identify hazards through sampling, incorporate controls into project specifications, and ensure that controls are followed. The program also applies to managing asbestos in buildings at the LBNL site and providing support to personnel who must enter asbestos containments or disturb asbestos-containing materials. The scope of the program includes employees, subcontractors, guests, and the environment. The program helps assure compliance with local, state, and federal asbestos control regulations.

TAP Finding 4. Some Facilities crafts employees who may occasionally perform work that might disturb building materials that contain asbestos lack required OSHA Class III asbestos training.

TAP Finding 5. The B77 abatement subcontractor performing work for the B77 Mechanical Upgrade Project did not meet OSHA and LBNL asbestos work practice and air sampling requirements.

Noteworthy Practices:

- An online asbestos awareness training course was developed for Laboratory-wide use.
- OSHA Class IV training was developed for EH&S Radiation Control Technicians to enable them to enter asbestos containments to perform their surveys.
- An asbestos work group was developed as an enhancement to the JHA Program.

Beryllium

The Beryllium Safety Program establishes policies and/or procedures that promote safety and awareness regarding the use of beryllium and beryllium-containing materials on site while controlling or eliminating potential personnel airborne exposure to beryllium. While there are no routine operations involving the generation of airborne beryllium, various operations at LBNL use beryllium-containing parts and tools, and research projects can involve the use of beryllium-containing compounds and alloys. Elements of the Beryllium Safety Program such as identification of materials that contain beryllium via procurement records, an online training/safety course, the LBNL JHA database, and the DOE Beryllium Registry have been instrumental in monitoring beryllium usage at LBNL and reducing personnel exposure when working with these materials.

A gap analysis was performed on the Beryllium Safety Program in December 2008 to identify potential program deficiencies in accordance with DOE 10CFR850, Chronic Beryllium Disease Prevention Program (CBDPP) and DOE-STD-1187-2005, Beryllium-Associated Registry Data Collection and Management Guidance. The internal gap analysis identified several minor observations that were corrected. In addition, the DOE Berkeley Site Office (BSO) at LBNL performed a Beryllium Safety Program audit in April 2009.

TAP Finding 6. References in the CBDPP are not current. Also, the CBDPP did not address all of the requirements established in 10CFR850 elements.

Biosafety

The Biosafety Program establishes policies and/or procedures that protect workers, the public, agriculture, and the environment from exposure to biological materials in use at LBNL. Elements of the program include policy management, line management, the Institutional Biosafety Committee, EH&S work review and authorization, training, waste management, medical surveillance, biosafety cabinet management, and technical assurance. The program applies to research, workers exposed to bloodborne pathogens, and other risks.

An external Biosafety Program assessment was conducted by University of California biosafety professionals in May 2009. Both the external assessment and the

LBNL quarterly field assessments of operations covered by selected Biological Use Authorizations (BUAs) and Biological Use Registrations (BURs) indicated that operations are predominantly compliant with some limited and specific findings.

TAP Finding 7. Beamlines designated as Biosafety Level 2 (BL2) containment work areas did not have:

- Proper access control, nor were posting requirements completely implemented per the BUA.
- Proper labels posted on a biohazardous waste container and an incubator where biological materials are processed per the BUA.
- A sink for handwashing.

TAP Finding 8. Training deficiencies:

- Training requirements and courses completed on two JHA training profiles were not consistent with person-specific training requirements noted on the BUA.
- A review of training profiles for workers listed on a BUR indicated that training was incomplete for nine of the 13 workers.
- A review of training profiles for workers listed on BUAs indicated that training was incomplete for a majority of workers.
- Training requirements and courses completed on four JHA training profiles were not consistent with person-specific training requirements noted on the BUA.

TAP Finding 9. BUA requirements noncompliances:

- No lab coat laundry service was provided in a BL2 containment work area, per National Institutes of Health and Centers for Disease Control BL2 containment criteria. Also, cloth lab coats in several BL2 containment work areas were reportedly thrown away and not cleaned.
- Hand soap dispensers were not present at the sinks in two laboratories, per requirements of the BUA.
- Chairs used during laboratory work involving handling of human cells were not covered with material that can be easily cleaned and decontaminated using disinfectant, per the BUA.
- A flow cytometer equipped with a Buffalo Filter Aerosol Evacuation System was in use but not covered by a BUA or BUR. In addition, the evacuation system's Ultra Low Penetration Air Filter was found to be under a recall and had not been tested and certified.
- Employees working under BUA B079 were not informed about specific risks and health recommendations related to working with HIV lentiviral vectors.

- The location and quantities of toxins stored in a laboratory were not entered into the Chemical Management System. Bar codes were not present on the toxin containers, as required by the BUA.

Noteworthy Practices

- The Biosafety Authorization System was revised to give supervisors the ability to view and manage locations and biosafety training information related to each person listed on a biosafety authorization.

Chemical Hygiene and Safety

The Chemical Hygiene and Safety Program (CHSP) establishes policies and/or procedures that help assure the safe handling, use, and storage of hazardous materials in laboratory, shop, and office settings. It identifies division, department, supervisor, and employee responsibilities, and establishes procedures for identifying, evaluating, and controlling hazardous materials. The program describes control measures (such as substitution, engineering, personal protective equipment [PPE], medical, administrative, and work practice controls) that personnel can take to protect themselves.

In general, implementation of CHSP requirements is good. Chemical safety-related training (> 90% completion on average) helps users understand the hazards and controls of their work, engineering controls and PPE are routinely and properly used, chemical storage and segregation are effective, and postings at area entrances and labeling of containers are adequate. Exceptions have been identified during the evaluation period, particularly in the areas of container labeling, use of drip trays, and mixing incompatible chemicals. Additionally, a food-storage refrigerator was found in one shop and an employee's lunch was found in another shop.

Chemical Management System

The Chemical Management System (CMS) provides a data storage and processing tool that is used LBNL-wide to produce regulatory compliance reports; provide access to hazard information, users, and emergency personnel; and provide an internal laboratory resource management tool.

In general, implementation of the CMS program is good. The program is broadly implemented at LBNL, and improvements in utilization and system management are ongoing. Exceptions were identified during the evaluation period, particularly in the areas of inclusion of consumer products in the database and participation of chemical users in the program.

Confined Space

The Confined Space Program establishes policies and/or procedures that help assure the protection of employees by implementing a permit system for persons entering Permit Required Confined Spaces, fulfilling the directives of DOE, and complying with federal

and state OSHA regulations. There were no injuries or exposures during FY 2009, and entries were conducted in a safe and compliant manner.

TAP Finding 10. The Hazard Management System and the EH&S Summary Report it generates do not contain confined-space hazards.

Construction Safety

The Construction Safety Program establishes policies and/or procedures that help assure that subcontractor construction-safety programs and performance are monitored to ensure compliance with LBNL requirements. This involves the review and approval of Construction Safety Plans for each project and conducting daily safety assessments of construction site activities and work practices. Worksite observations are recorded using predetermined criteria and categories to facilitate analysis.

Noteworthy Practices

- Staff acquired in FY 2009 has been dedicated to improving the Construction Design process to ensure that safety requirements are more efficiently included in project specifications.

Controlled Substances

The Controlled Substance Protocol establishes policies and/or procedures that help assure compliance with Section 802(6) of Title 21, 21CFR Part 1300 of the United States Code & California Health & Safety Code Section 11100. LBNL is not a distributor of controlled substances as defined in Section 802. As such, a protocol was created and is in place for Schedule I, II, III, IV, and V Controlled Substances used in science and research.

Approximately three to five Controlled Substance orders are placed annually at LBNL. To establish controls that are compatible with science and research operations, the Controlled Substance Advisory Committee (operational Subject Matter Experts) convenes and develops the Controlled Substance Protocol, which serves as a guide for stakeholders who either use controlled substances in science and research projects or are involved in their procurement, receiving, delivering, handling, securing, inventorying, and disposal. No program enhancements were implemented during FY 2009.

Cranes and Hoists

The Cranes and Hoists Program establishes policies and/or procedures that help assure the safe operation of crane and hoist equipment. The EH&S Division Crane, Hoisting and Rigging Safety Subject Matter Expert (SME), with support from the Crane and Rigging Service Contractor Representative, performs equipment inspections and review of planned lifts to ensure that operations will be conducted in a safe and compliant manner. There was a single crane High Consequence/High Value lift performed without incident during the year.

During FY 2009, 24 cranes and hoists were reviewed. Records maintained by the service contractor were reviewed and found to be complete. All operators identified for the cranes reviewed were found to be adequately trained.

DOELAP Accreditation

The DOE Laboratory Accreditation Program (DOELAP) establishes policies and/or procedures that help assure adherence to DOE Orders (such as DOE Order 414.1C, 10CFR830, 40CFR61 Appendix B, DOE EH-0026, and ANSI N13.30). The goal of the program is to assure that workers at LBNL will remain safe, their dosimetry accounted for, and radiological hazards mitigated. Approximately one-quarter of LBNL personnel are included in the program.

TAP Finding 11. One dosimetry technician's training qualifications had lapsed for the following EH&S procedures: 370, 371, 373, 386, 387, 388, and 389.

Disability Management

The Disability Management Program establishes policies and/or procedures that assure effective implementation and delivery of personal illness disability management services to LBNL managers and employees. All LBNL employees are eligible for these services, which enable employees to take time away from work when their health or the health of a family member affects their ability to perform work.

Electrical Safety

The Electrical Safety Program establishes policies and/or procedures that help assure compliance with all electrical safety standards (including OSHA, National Electrical Code, and National Fire Protection Association Standard 70E). The program includes the evaluation of workplace conditions and worker practices (both employee and subcontractor). In addition, the program covers development and delivery of training, evaluation of electrical equipment, approving Activity Hazard Documents (AHDs), management of electrical work permits, interpretation of codes and standards, and investigation of incidents.

Electrical hazards are ubiquitous and widely recognized across LBNL operations. The goals of zero incidents and full compliance with applicable standards are accepted by LBNL employees but have not yet been fully implemented.

TAP Finding 12. Not all divisions completed the LBNL 2008 annual Lock Out/Tag Out (LOTO) review/inspection as required by PUB-3000, Chapter 10, Section 18.15 (*Periodic Inspections*).

TAP Finding 13. A subcontractor struck a live conduit, resulting in work stoppage on the Seismic Phase 2 project.

TAP Finding 14. Electrical cords were found damaged, plugged into nonconstruction-approved devices, daisy-chained, missing ground pins, in unprotected runs, and improperly used in construction sites.

Noteworthy Practices

- The Nationally Recognized Testing Laboratories (NRTL) Equipment Inspection Program was initiated site-wide, with initial implementation successfully logging 20,000 items and inspecting several thousand of the items logged. EH&S created and manages a database of equipment inspections. This has been well received and has attracted interest from other DOE facilities.
- The Electrical AHD program was implemented to document work authorization and qualifications for any worker who is exposed to an electrical hazard.
- Training was upgraded with the qualified worker class being extended, and two new classes added (NFPA 70E and insulated gloves/tools).

Emergency Eyewash/Shower

The Emergency Eyewash and Safety Showers (EESS) Program, in conjunction with the CHSP, establishes policies and/or procedures for selection, installation, and periodic testing of equipment. The primary objective of the program is to assure availability of facilities to assist workers where the potential for eye or skin contact with corrosives, irritants, or other injurious materials exists, with a secondary objective being the assurance of compliance with established regulations for EESS equipment.

EESS equipment is available laboratory-wide where corrosives, irritants, or other injurious materials are used. Employees generally possess an understanding of where installed equipment is located, how to use it, and what to do if an emergency occurs. Periodic testing of equipment is performed quarterly by the Facilities Group. Proposed installations are reviewed to ensure compliance with internal requirements and ANSI recommendations.

TAP Finding 15. Quarterly inspections and flow testing of sampled EESS units were not consistently carried out per established frequency. In addition, some EESS units provided marginal distribution of water and two were incapable of flushing both eyes simultaneously. Absence of a flow restrictor in an EESS unit shower caused very low flow and distribution through the eyewash nozzles.

TAP Finding 16. The Facilities database containing EESS unit locations was not up to date.

TAP Finding 17. Fifty percent of eyewashes evaluated were installed in an offset manner that would prevent simultaneous use of the eyewash and shower per referenced standards.

Environmental Management System

The Environmental Management System (EMS) establishes policies and/or procedures that help assure a robust process for preparing Environmental Management Programs that address the setting of objectives and targets, developing of performance metrics, and monitoring of progress.

A third-party auditor performed an assessment of the program to determine compliance with DOE requirements regarding EMS programs. The audit evaluated all 15 EMS program elements and found no nonconformances. A Certificate of Conformance to DOE Order 450.1A was issued.

Environmental Restoration

The Environmental Restoration Program establishes policies and/or procedures that help assure that LBNL investigates and remediates the historic releases of hazardous waste and chemicals that have occurred at its main site in the Berkeley hills. Investigations and any required cleanup are conducted under the direction of the California Department of Toxic Substances Control.

Groundwater sampling, groundwater treatment system operations and maintenance, sample analyses, environmental contamination assessments, and program documents and records were reviewed with no deficiencies identified.

Ergonomics

The Ergonomics Program establishes policies and/or procedures that help assure the minimization or elimination of employee exposure to risk factors for work-related musculoskeletal disorders, and to help improve work practices, software, furniture, tools, and equipment. The Ergonomics Team helps divisions identify, prevent, and control ergonomics-related hazards. Strategies for reducing risk factors focus on engineering controls, when feasible, and/or administrative controls. Ergo Team activities consist of risk-factor surveillance, worksite evaluations and improvement, coordination with all LBNL divisions and with other groups within EH&S (e.g., Health Services, Training), program review, and evaluation.

Noteworthy Practices

- The Ergo Advocate program was expanded by providing training to 24 newly assigned division ergo advocates.
- Approximately 3,600 people are in the Remedy Interactive database, with 84% reduction of users in the High Risk category.
- The LBNL program was benchmarked with Remedy Interactive's "Top 7" company users (including HP, Genentech, and IBM). LBNL has a risk-reduction rate 42% higher than group mean and reduces employee discomfort at a rate 25% higher than the benchmark mean.

- A Service Quality Survey was launched. In the survey, 87% of respondents reported high effectiveness in reducing discomfort while 84% reported that ergonomics evaluations were “Effective” to “Very Effective” in improving work performance.

Fall Protection

The Fall Protection Program establishes policies and/or procedures that help assure the safety of LBNL employees, visitors, guests, and subcontractors who must work on any surface having an unprotected edge with a potential fall of 6 feet or greater. EH&S fall protection oversight is governed as required by LBNL PUB-3000 policy, and Occupational Safety and Health Administration (OSHA) Fall Protection Standards.

The program includes the assessment, design, and installation of anchor points throughout the complex. As of FY 2009, 41 engineered fall-protection plans have been completed. Assessment and correction of the remaining 22 roofs (with multiple fall hazards) are ongoing. During FY 2009, no Noncompliance Tracking System or Occurrence Reporting and Processing System (ORPS) reports citing deficiencies in the Fall Protection Program were generated, but 14 high-risk deficiencies were noted on construction job sites during the year and documented in the Safety Net. There continues to be a relatively high noncompliance rate among subcontractors primarily because of safety cultural differences between LBNL and outside contractors.

Fixed Treatment Units

The Fixed Treatment Unit (FTU) Program establishes policies and/or procedures that help assure the proper operation and maintenance of treatment units. Permit-required documentation was reviewed and all three of the Permit-by-Rule units were inspected during the assessment. Compliance plans, notification records and inspection logs were found to be complete and up to date.

TAP Finding 18. Emergency contact information for the FTU technician was not available at the site nor was it included in the Contingency Plan.

TAP Finding 19. The current version of the B67 FTU Monthly Maintenance & Calibration Procedure and the B67 FTU Monthly Checklist were not in use.

TAP Finding 20. The B77 FTU inspection schedule did not include the frequency of calibration of 1) the pH and the ORP probes and 2) the water-flow meter. Set points for pH & ORP probes were not documented in a procedure.

Laser

The Laser Safety Program establishes policies and/or procedures that help assure the safe use of lasers at LBNL. The program contributes to employee safety through hazard assessment, development of controls, training, and user feedback, including the

distribution of Lessons Learned combined with Laser Safety Officer (LSO) visits to laser-use areas.

User training activity is high and all work is conducted either under an AHD, a Temporary Work Authorization (TWA), or Subcontractor Job Hazards Analysis (SJHA). User feedback is also very positive. LSO walkarounds continue to identify opportunities for improvement.

TAP Finding 21. The newest version of PUB-3000 Section 16.5.3, Laser Alignment and Beam Manipulation, requires the LSO to complete the Alignment Eyewear Authorization Form (Appendix C) if laser alignment eyewear is allowed. The use of this form has not started yet or been applied to existing AHDs that allow alignment eyewear but do not call for the form.

TAP Finding 22. ANSI Z136.1–2000, Safe Use of Laser Standard, Section 4.6.4 requires that a blocking barrier, screen, or curtain that can block or filter the laser beam at the entryway shall be labeled with three threshold limit and exposure times and the beam exposure conditions under which protection is afforded. Not all such barriers are labeled at this time.

Noteworthy Practices

- Laser Safety Protocols were generated.
- The Authority Having Jurisdiction role was transferred from BSO to the LBNL LSO.
- Laser Program forms (including the Alignment Approval Form, On-the-Job Training Form, and Laser Audit Form) were improved to enhance usability.
- A Laser Safety Fair was conducted on site.
- A new laser alignment approval approach and documentation review was developed by the Laser Safety Committee.
- A new Web-based laser safety training course (EHS 302) and associated classroom lecture course (EHS0303) was completed and delivered.

Lead

The Lead Program establishes policies and/or procedures that help assure that employees and subcontractors are protected from overexposures to lead in the workplace. Components of the program include training, medical surveillance, field assessment, and other controls, such as ventilation, procedures, and PPE. There is also a field oversight function and provisions for Lessons Learned and other feedback mechanisms.

Based on workplace evaluations and objective air-monitoring results, employees and subcontractors appear to be well protected and are working in compliance with procedures, requirements, and regulations.

Lock Out/Tag Out (LOTO)

The Lock Out Tag Out (LOTO) program establishes policies and/or procedures that help ensure proper de-energizing and securing of hazards prior to initiating work on or around electrical systems. This program has Laboratory-wide application, with the majority of hazards encountered in Facilities and construction projects. The program specifies training, education, permits, inspections, code interpretations, and procedures.

Field implementation of the LOTO Program continues to improve and is presently at a very high level. LOTO has become part of the LBNL safety culture, as evidenced by daily requests to the Electrical Safety Engineer for assistance and guidance. Field evaluations in 2009 have shown that LOTO is practiced when required, but that some execution details may result in technical noncompliances or incidents. The rigorous enforcement of LOTO permits for subcontractors—more than 300 issued this year—has resulted in far greater compliance and fewer incidents on construction projects.

TAP Finding 23. Administrative conditions were identified. These included: 1) one improperly filled out administrative tag discovered at a Building 71 construction project; and 2) a construction manager requested an extension on a permit that had expired before the work began. It was noticed that a 480-volt source was not identified in the original review of the permit.

TAP Finding 24. Seven process-related procedural conditions were identified. These included: 1) one disconnect found not to be locked out due to an insufficient equipment-specific LOTO; 2) an employee who did not attempt to restart the equipment after the LOTO was applied; 3) a Preventative Maintenance Technician who did not have his phone number on his LOTO tag; 4) a LOTO briefing that was inadequate; 5) an equipment specific procedure that did not match the work being done; 6) incorrect application of the “live-dead-live” procedure; and 7) safety standby did not have a nonconductive object in case electrician became “hung up” on the circuit.

TAP Finding 25. One PPE-related procedural condition was identified. This was an LBNL electrician getting ready to switch a 480 breaker with a top button unbuttoned and keys dangling off a belt loop.

Noteworthy Practices

- The Facilities Group implemented a program of increased supervisory oversight in the field to ensure that their workers understand and practice correct LOTO procedures.
- All divisions began to survey equipment requiring specific written LOTO procedures, and hundreds have been written.
- The EH&S training program was completely redesigned to include 3.5 hours of classroom and 4 hours of practical training.

Machine Guarding and Shop Safety

The Machine Guarding and Shop Safety Program establishes policies and/or procedures that help assure safe operations involving the use of shop equipment and power tools by qualified and authorized personnel. In addition, the program assesses the condition of tools to ensure that shop equipment and power tools are used properly for their intended purpose, and equipment and power tools are properly guarded (based on the hazard). During FY 2009, 23 technical areas containing shop machinery were reviewed and the program was determined to be 91% compliant.

TAP Finding 26. During FY 2009, five machine tools were found to be missing required debris shields.

TAP Finding 27. Lack of required guards was observed. These included: 1) three employees using machine tools without guards; 2) 12 unguarded pinch/nip points; and 3) eight unguarded points of operation (other than entanglement and pinch/nip points identified above).

Material Control and Accountability

The Material Control and Accountability (MC&A) Program establishes policies and/or procedures that help assure compliance with DOE M 470.4-6, the LBNL MC&A Plan, and the EH&S Procedure 740 (*Nuclear Material Control and Accountability*) regulations. One Technical Assurance Assessment Plan (TAAP) assessment of MC&A was performed in FY 2009, and focused on compliance with the above standards. A review of LBNL's effectiveness in meeting applicable DOE MC&A requirements was conducted by an external consultant in April 2009.

Medical Biohazard Waste

The Medical Biohazard Waste Program establishes policies and/or procedures that help assure the inspection of medical waste and biohazardous waste-generating areas on a quarterly basis and provides guidance regarding regulatory requirements to division personnel. These reviews are performed in compliance with the Waste Management Section TAAP for Medical Waste (dated April 27, 2009). Medical waste is regulated by the Medical Waste Statute, and both medical waste and biohazardous waste are covered under LBNL policy in PUB-3095.

The Technical Assurance Assessment determined that audited medical waste (red-bag) was being managed in a manner compliant with the Medical Waste Statute. In clear-bag biohazardous waste-generating laboratories, most management practices were compliant. However, several minor deficiencies were noted during FY 2009. These observations are often corrected on the spot (i.e. labeling deficiencies, sharps containers for clear-bag wastes that were more than two-thirds full, etc.).

Noteworthy Practices

- Inspection forms were revised to clarify the requirement for the transportation of medical waste in “rigid container with tight fitting lids.”
- Separate inspection forms were also developed for biohazardous waste to differentiate some of the varying requirements. A separate inspection form was developed to assist in the management of biohazardous waste.

Noise

The Noise Program establishes policies and/or procedures that help assure the protection of employees from noise-induced hearing loss. This is accomplished by identifying hazardous noise sources at LBNL and the employees who may be at risk for noise exposure based on their job duties and/or work locations. Engineering and/or administrative controls are used where feasible to ensure employee exposures to noise are kept below an eight-hour time-weighted average exposure of 85 decibels (A-weighted, or dBA). Whenever controls are insufficient to keep exposures below an eight-hour time weighted average of 85 dBA, the exposed employee(s) will be enrolled in the LBNL Hearing Conservation Program (HCP). The annual training component of the HCP helps to ensure that employees will be able to identify noise hazards in their work areas and take the necessary precautions to protect their hearing.

TAP Finding 28. Employees who belong to an exposure group (as identified in their JHAs) were not included in the HCP. Therefore, they have not taken EHS0285 (*Noise Exposure Hearing Test*).

Non-Construction Safety Assurance

The Non-Construction Safety Assurance Program establishes policies and/or procedures that help assure that all subcontractors, vendors, and guests who perform work at LBNL facilities do so in a safe manner in compliance with applicable regulations. Each division is responsible for ensuring that its subcontractors, vendors, and guests perform work on site in compliance with LBNL EH&S requirements. The EH&S Division helps LBNL divisions carry out their responsibilities through the Non-Construction Safety Assurance Program that is documented in PUB-3000 Chapter 31. This policy applies to all LBNL divisions and all hands-on work performed at LBNL facilities by nonconstruction subcontractors, vendors, and guests who are not under direct supervisory control of LBNL personnel.

TAP Finding 29. Implementation of Non-Construction Safety Assurance Program process steps was less than adequate for a scope of work. LBNL identified safety deficiencies requiring the work to be stopped and an Occurrence Report was submitted.

TAP Finding 30. Completion of some Subcontractor Job Hazards Analysis and Work Authorization (SJHAWA) forms was less than adequate. During the assessment period,

some of the SJHAWAs reviewed lacked signatures, work hazard ratings, dates, responses to all questions, and adequate descriptions of the work.

TAP Finding 31. Information gathered during the program's safety assurance processes indicated that safety performance by some subcontractors was less than adequate.

Nuclear Safety Management (Inventory)

The Nuclear Safety Management (Inventory) Program establishes policies and/or procedures that help assure compliance with all aspects of the Radiation Protection Group (RPG) operations that are required for correct compliant inventory control per 10CFR830 and DOE STD 1027-92 CN1.

The plan requires that the Radiological Control Manager assess the effectiveness of the RPG inventory-control program each quarter by auditing a representative sample of documented work activities for compliance with EH&S Procedure 707 and 750 requirements, which implement in part the requirements of 10CFR830 and DOE STD 1027-92 CN1 inventory-control requirements.

TAP Finding 32. RWA (Radiological Work Authorization) 1020 was found to have a small number of low-activity (nCi and below) items that were not listed on their inventory. These items must be characterized by the Principle Investigator and added to the Heavy Elements Research Laboratory (HERL) inventory.

TAP Finding 33. Specific instances were identified during the site-wide confirmatory inventory that were inconsistent with the inventory-control requirements necessary to satisfy requirements of DOE STD 1027 CN1.

Noteworthy Practices

- All monthly Facility Nuclear Fraction reports were present and indicated that all non-accelerator facilities contained inventory less than Hazard Category 3 thresholds.
- All excluded sealed sources at LBNL have a valid special form certificate and all reviewed generally licensed sealed sources met the requirements for exclusion from the inventory.
- RPG standardized the labeling of incoming radioactive material stock vials. This practice has significantly improved the process of performing inventory reviews.

Occupational Injury and Illness Reporting and Recordkeeping

The Occupational Injury and Illness Reporting and Recordkeeping (OIIRR) Program establishes policies and/or procedures that help assure compliant injury and illness reporting and recordkeeping as required by OSHA, and DOE. Capturing, quantifying, and analyzing occupational injury and illness data is also an essential part of identifying and

controlling workplace hazards and can be used as a measurement tool for assessing and improving safety performance.

OIIRR Program records were maintained in a complete and current state. The overall injury review and reporting process is in place and functional although internal program assessment and the Health, Safety, and Security audit earlier this fiscal year identified issues that require attention to improve the effectiveness of the program.

TAP Finding 34. Some injury reports (supervisors and liaisons) are submitted late with incomplete or no data.

TAP Finding 35. The OIIRR Program document requires notification of the EH&S Division Director and BSO every time the OSHA log is updated. It is noted that updates occur approximately once a month and therefore the program procedure requirement is not met. The notification requirement should be restated in a manner that is practical and that can be met reliably.

Occupational Medicine

The Occupational Medicine Program is a DOE- and OSHA-mandated program. The purpose of the program is to ensure the health and safety of workers relative to their job requirements and potential hazardous exposures.

Employees are offered examinations at the intervals required by OSHA regulation. Additionally, all required drivers are processed per regulation through Health Services. This data is retrievable from the Occupational Health Manager (OHM) database.

As a component of continued accreditation, Health Services performs quarterly peer review and quality improvement evaluations on areas identified as a result of these peer reviews.

Noteworthy Practices

- Health Services received notice of accreditation from the Accreditation Association for Ambulatory Health Care. This was Health Services' second re-accreditation, resulting in a second full three-year term of re-accreditation.
- Health Services conducted benchmarking with Industrial Hygiene on overlapping programs (such as respiratory protection, beryllium, and lead) to ensure requirements are being met.

Personal Protective Equipment

The Personal Protective Equipment (PPE) program establishes policies and/or procedures that help assure the proper selection and use of hand, head, eye, foot, and skin protection. Hearing and respiratory protection are covered under separate programs.

During FY 2009, 18 authorized work operations were reviewed. Operations were selected at random during scheduled and unscheduled Subject Matter Expert (SME) field visits. Each piece of PPE observed was found to be maintained properly.

TAP Finding 36. Some users did not receive specific PPE training as required by 29CFR1910.

TAP Finding 37. Training programs for certain types of PPE (head, eye, hand, foot, skin protection) are not available. Training should include how to select PPE, how to don and doff PPE, limitations of PPE, maintenance, storage, and/or disposal.

TAP Finding 38. During FY 2009, there were five cases where PPE was not used as authorized.

Powered Industrial Trucks

The Powered Industrial Truck (PIT) Program establishes policies and/or procedures that help assure the safe operation of more than 40 qualifying vehicles (including forklifts and electric pallet jacks) at LBNL. In-class training is presented by SMEs who have completed 40-plus hours of training. Employees passing the written and practical examinations are considered competent in the operation of equipment under normal operating conditions. Facilities and EH&S combine resources to achieve maximum oversight of the PIT program and comply as required with PUB-3000 and OSHA PIT standards.

During FY 2009, 47 PIT operations were inspected. Each PIT was randomly selected during the review while the operator was observed performing work. If the observation was 100% compliant, the operator was congratulated for his or her safety awareness.

Noteworthy Practices

- EH&S Training purchased a card printer to expedite issuance of new operator cards and operating permits. The permit features an employee photo and all operational related information, i.e. expiration date.
- Additional practical instructors were trained to help address the demand for PIT certification and training.

Preplacement Physicals

Preplacement medical evaluations are required by 10CFR851 and OSHA. The purpose is to evaluate employees against the work they have been hired to do to ensure safety from a health-based perspective. Medical evaluations are offered to all new hires.

Radioactive Material Transportation

The Radioactive Material Transportation Program establishes policies and/or procedures that help assure compliance with DOT 49CFR173 (Shippers General Requirements for Shipments and Packages) regulation and DOE Order 460.1 B (Packaging and Transportation Safety), hazardous materials regulations, and International Air Transport Association dangerous-goods regulations.

Adherence to the program helps assure that workers will remain safe from transportation accidents and radiological hazards. The Radiological Control Manager and staff are required to assess the effectiveness of the Radioactive Material Transportation Program with emphasis on material receipts, on-site transfers, on-site/off-site deliveries, packaging, off-site shipments, staff training, and recordkeeping.

Radiation Protection

The Radiation Protection Program establishes policies and/or procedures that help assure adherence to 10CFR835 regulation. The program also assures the workers will remain safe from radiological hazards.

The program requires the Radiological Control Manager and staff to conduct a quarterly assessment of the effectiveness of one of the elements of the Radiation Protection Plan.

TAP Finding 39. There is no documented evidence of RPG approving procurement of sealed sources as required by EH&S 711, *Sealed Source Program*.

TAP Finding 40. The language within PUB-3000, Chapter 21 (*Radiation Safety*) and RPG procedures was found in several instances to be contradictory.

Respiratory Protection

The Respiratory Protection Program establishes policies and/or procedures that help assure the protection of employees from inhalation hazards whenever engineering, administrative, and/or work practice controls are unfeasible and/or insufficient to keep employee exposures below relevant occupational exposure limits. The program contributes to employee safety by identifying potential airborne contaminants in work areas (Hazard Evaluation), recommending controls, and providing appropriate respiratory protection and training to employees.

Based on employee interviews, field evaluations, and the lack of CATS, ORPS, and other relevant indicators, the program is considered to be functioning effectively.

TAP Finding 41. There is no validation of JHA completion prior to training or fit-testing of respirator wearers.

Satellite Accumulation Areas

Satellite Accumulation Areas (SAAs) and associated Mixed Waste Programs establish policies and/or procedures that help assure compliance with defined storage requirements in research or operational areas where hazardous wastes are temporarily accumulated prior to transfer.

TAP Finding 42. Flammable liquids were stored in inappropriate containers, and deficiencies were found in signs and labels.

TAP Finding 43. Three hundred and ninety-nine waste-storage areas were inspected and 78% were found to be in compliance with LBNL policies and regulations. The most prevalent area of noncompliance was in the category of SAA signs and labels. Flammable-waste storage practices also emerged as an area of noncompliance.

Storm Water Quality

The Storm Water Quality Program establishes policies and/or procedures that help minimize the impact of LBNL activities on the quality and quantity of storm-water runoff from the site. No treatment of storm-water runoff is performed on site, with all drainage occurring by means of gravity through the storm drainage system to nearby Strawberry Creek and its tributaries.

To remain in compliance with the regulations, the Storm Water Quality Program performs periodic sampling, validates analytical results, evaluates and trends results, conducts routine inspections and observations, prepares documents in accordance with permitting requirements, and assists other divisions and research programs in understanding and complying with storm-water regulations.

TAP Finding 44. A cooling tower release and a petroleum spill adsorbent were not cleaned up as required.

TAP Finding 45. The Storm Water Pollution Protection Plan did not identify a specific responsible person, specific training dates, and a five-year record-retention period.

Underground and Aboveground Storage Tanks

The Underground and Aboveground Storage Tanks Program establishes policies and/or procedures that help assure permitting, construction, design, monitoring, recordkeeping, inspection, response to accidental releases, and tank closure, where applicable, in compliance with local, state, and federal requirements.

TAP Finding 46. Tank and drum storage areas were not inspected and documented as required by Facilities and EH&S procedures. Underground storage tank operating procedures were not current.

Ventilation

The Ventilation Program establishes policies and/or procedures that help assure the proper design, selection, installation, maintenance, and use of local exhaust ventilation systems. This includes periodic testing and calibration of approximately 1,000 units in laboratories and industrial work areas. The primary objective of the program is to assure the control of contaminants that could pose an exposure risk to employees and the environment, with a secondary objective being the assurance of compliance with regulatory and locally established requirements.

Local exhaust ventilation equipment is available laboratory-wide and routinely used by employees where process-related contaminants are expected to be present. Employees generally possess an understanding of when and how to use equipment, and know what to do in the event of malfunction. Periodic testing and calibration of equipment is generally effective in assuring proper equipment performance, but surveys sometimes fail to occur within the established schedule. Equipment is generally in satisfactory mechanical condition, but work practices that reduce system performance (primarily housekeeping and sash positioning) have been observed.

TAP Finding 47. Ventilation system surveys were not completed per the requirements outlined in PUB-3000, Section 4.6. Specifically, some systems in the Ventilation Database were shown as past due (three months beyond nominal due date).

X-ray Safety

The X-ray Safety Program establishes policies and/or procedures that help assure compliance with EH&S Procedure 735 (X-ray Machine Authorization Program) and 10CFR835. The program is designed to protect employees from mishaps involving X-ray machines and related radiological hazards.

The Radiation Protection Group (RPG) reviews all aspects of the program. Adherence to EH&S Procedure 735 assures that workers at LBNL will remain safe from X-ray machine accidents and radiological hazards. The plan requires that the X-ray Safety Officer and staff assess the effectiveness of the RPG's X-ray program on a quarterly basis.

X-ray authorization areas were reviewed with the X-ray laboratory staff to ensure the work was correctly defined and all machine-operating parameters were correctly identified. Each X-ray machine and its analysis documentation were reviewed to ensure they met current internal requirements, functioned properly, and that maintenance log books were being properly kept up. Radiation Authorization Reporting System (RADAR) noncompliance tracking records were reviewed, identified, tracked, corrected, and when appropriate, closed out.

V. UC/DOE Contract 31 Performance Evaluation and Measurement Plan Self-Assessment

The prime contract between DOE and the University of California (Contract 31, Clause I.86, and Appendix B) includes a Performance Evaluation and Measurement Plan (PEMP) that establishes annual performance goals, objectives, measures, and targets for environment, safety, and health. As part of the contract, LBNL and University of California Office of the President (UCOP) functional managers conduct self-assessments to evaluate performance against the PEMP. Although specific measures may change during the annual updating, the PEMP performance measures are always within the framework of the DOE Office of Science-mandated objectives. The Appendix B self-assessment is LBNL's primary mechanism for evaluating its contract performance for ES&H.

The EH&S Division collects data and information quarterly, starting at the beginning of the fiscal year, to provide evidence of performance against the PEMP. This information is presented at joint quarterly meetings of LBNL, UCOP, and DOE staff. When applicable, they identify risks and recommend improvements to the ES&H program.

The FY 2009 UCOP/LBNL Self-Appraisal summarizes the cumulative ES&H performance for the year. This report is the formal submission to DOE to meet the assessment requirements of the DOE/UC contract. At the end of the fiscal year, DOE independently evaluates the program and makes recommendations for improvement.

Performance Results

In FY 2009, LBNL's self-assessment awarded a numerical score of 3.3, an equivalent B+ score in Goal 5.0, Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health and Environmental Protection. The following practices and opportunities for improvement were identified through this self-assessment.

Noteworthy Achievements

The radioactive materials inventory across LBNL was reduced by 65% and rad inventory of LBNL buildings was reduced to less than Hazard Category 3 nuclear facility thresholds. The ALARA (As Low As Reasonably Achievable) program ensured that whole-body doses at LBNL were among the lowest in the DOE Office of Science laboratory complex, indicating effective work planning and control, training, work practice, and oversight. No internal doses were received by any LBNL radiation worker during the same period, indicating effective work practices and controls.

LBNL's Environmental Management System (EMS) was upgraded to meet DOE's new requirements in DOE Order 450.1A, resulting in no findings or corrective actions from an external audit.

DOE's Berkeley Site Office (BSO) declared in June that LBNL's EMS conformed to its EMS requirements.

The Laboratory shipped 53 tons of depleted uranium for off-site treatment and disposal from the Bevatron, reducing the nuclear fraction of that facility significantly. By using an existing LBNL treatment and disposal contract at Energy Solutions, the project realized a savings of approximately \$100,000.

LBNL shipped more than 60 items of low-level legacy waste, thereby reducing the legacy inventory at the Hazardous Waste Handling Facility. In addition, progress was made in characterizing additional legacy wastes in preparation for future disposal. The Laboratory continued to keep the mixed-waste inventory as low as possible by completing a mixed-waste shipment that included newly generated items as well as legacy items.

The Laboratory is developing responsibilities for the liquid nitrogen fill station and dewars at B70 to make sure that the dewars and filling station will be inspected and operational, expanding such effort to other areas once protocols are complete.

The Laboratory performed an internal LBNL Laser Safety Program Technical Assurance Assessment in preparation for a BSO assessment, which identified issues for resolution prior to the formal assessment, resulting in no high-level findings for resolution. A Laser Authority Having Jurisdiction was reinstated due to successful assessment. This successful process has been extended to Fall Protection, and will be expanded to other Program Assessments scheduled by BSO. The Laboratory initiated a laser-safety working group in the Energy Facility Contractors Group (EFCOG), which allows LBNL to partner with DOE to discuss and review new laser-related issues.

LBNL performed an analysis of all 2008 injury case (first aid and recordable) SAARs to determine if the Laboratory was addressing ISM deficiencies and developing controls to effectively prevent recurrence. The analysis results demonstrated that LBNL injury analysis and reporting was not fully effective, particularly in the alignment of corrective actions with identified causal factors. Self-identification and reporting in CATS was done prior to the HSS audit.

LBNL has achieved approximately 685,000 hours without a lost-time injury in construction. This continues to be a strong performance and significantly better than the industry average.

The Laboratory completed the initial implementation of the Nonconstruction Subcontractor Safety Program new work control process:

- Contract language for subcontractors was modified to require safety orientation and the completion of a SJHAWA Form.
- A prejob meeting is required between the subcontractor/vendor/guest and the requisitioning manager to review the SJHAWA form. The result of this meeting is

- an authorization for specific subcontractor/vendor/guest personnel, identified by name, to perform the work that is authorized.
- Using a risk-based graded approach, oversight is required by the requisitioning manager using forms have been provided to document the oversight.
 - A LBNL nonconstruction subcontractor safety manager was hired in July to provide support for this new process and to add additional oversight for the work of subcontractors/vendors/guests.

LBNL's Health Services has achieved re-accreditation by the Accreditation Association for Ambulatory Health Care for a three-year period, the highest vote of confidence available from that organization. The Accreditation Association uses practicing health care professionals to perform the survey. This performance-based survey process facilitates the adoption of best practices to ensure clinic compliance with nationally recognized standards.

LBNL formed its own Institutional Review Board to better serve human-subjects researchers. The LBNL Human Subjects Committee has cut the time for reviews by three to four weeks, and made the transition with no lapses in approval.

LBNL established an H1N1 Influenza Pandemic Planning Committee to prepare the Laboratory in the event of a more serious outbreak next winter. This includes preparing business continuity plans, developing communications, and implementing control measures in a manner consistent with the World Health Organization and U.S. Centers for Disease Control guidelines.

The Laboratory implemented a new policy that links GERT and card-access entrance. Employees without valid GERT will have all badge access authorizations revoked. This includes room, building, and general site access; entrance to any area that requires card access during business hours; and Laboratory entrance after hours or on weekends.

The Laboratory increased UC Police Department traffic patrols in an effort to improve safety. Those who violated the California Vehicle Code for driving and parking were cited and ticketed. The patrols, which started late in FY 2008, have helped reduce incidents involving cars, bicycles, and pedestrians, some of which resulted in injury. In addition to ticketing drivers who speed or run stop signs, patrols have issued citations for parking a car in motorcycle spaces, red zones, and handicap spaces without authorization, or for blocking fire hydrants.

A site-wide Safety Review of Pedestrian and Traffic Infrastructure was completed by an engineering firm in December 2008. Recommendations from this study will be used to improve traffic and pedestrian safety at the Laboratory.

LBNL implemented new PPE and food/drink requirements for technical areas to reduce the potential for accidents and to improve safety for employees. The use of PPE was previously based on exposure to hazards related to the type of activity that was taking place. With the revision, use of PPE is based on potential exposure to hazards present in specific physical areas. Once a person crosses the threshold of an area with posted PPE

requirements, he or she must adhere to those requirements. The policy, stated in the LBNL Health and Safety Manual (PUB-3000), requires a minimum of safety glasses, long pants, and closed-toe shoes in technical areas.

The Laboratory enhanced Business Continuity Plans by expanding efforts to include continuity planning goals that engage all divisions, research, and operations to help rapidly resume essential functions if disrupted by an unplanned event or emergency. Specific accomplishments include:

- Forming a Business Continuity Planning Steering Committee that includes Operations and Research Division representation.
- Developing a Business Continuity Policy and Charter.
- Adopting a new Web-base planning tool (UC Ready).
- Rolling out the planning tool and process to all Laboratory divisions.
- Developing pandemic planning and response actions.
- Drafting an annex to the Laboratory-wide continuity plan that includes pandemic planning.
- Revising the biosafety policy in PUB-3000 to clearly define roles and responsibilities and requirements of work with biological materials.
- Participating in the Nanoscale Science Research Center and EFCOG engineered nanomaterials work groups to improve control guidance; carrying out hazard evaluations and exposure assessments for engineered nanomaterials.

Opportunities for Improvement

LBNL leadership will continue its commitment and effort to improve and sustain excellent safety performance in FY 2010 by aggressively ensuring that the programs formulated in earlier years are effective in reducing injuries, and implementing new programs to achieve and maintain “best-in-class” ES&H program performance in both Total Reportable Case (TRC) and Days Away, Restricted, or Transferred (DART). LBNL will continue to pursue the causes and contributors of recordable injuries.

Due to two incidents involving the mixing of incompatible wastes, LBNL promulgated a new policy stipulating that waste nitric acid solutions may not be stored in an SAA. Waste solutions must be neutralized via an approved benchtop treatment procedure prior to placement in an SAA. This will avoid the storage of nitric acid solutions, and thereby eliminating the opportunity to inadvertently mix incompatible wastes.

LBNL will continue to strengthen its Radiation Protection Program consistent with 10CFR835 requirements; specifically, Radiological Work Authorizations and postings, contamination and boundary control, technical basis documentation, and training. LBNL is in the process of developing an institutional methodology for performing hazards analysis for radiological facilities.

The DOE Office of Independent Oversight, within the Office of Health, Safety, and Security (HSS), inspected ES&H programs at the DOE LBNL during January and February 2009.

The final report contained:

- Four strengths (Proactive Management, Advanced Light Source [ALS] Work Controls, Construction Safety, and Innovation in Elements of Assurance System)
- Three weaknesses (Requirements Management, Work Control, and Assurance Processes)
- Ten findings within the three weaknesses
- Multiple Opportunities for Improvements

The 10 findings are:

C1 – Job Hazards Analysis
C2 – Nonradiological Exposure Assessments
C3 – Radiation Protection
C4 – Document Infrastructure
C5 – Electrical Safety
D1 – Self-Assessment Program
D2 – Issues Management
D3 – Injury and Illness Reporting
D4 – Lessons Learned
E1 – Chemical Management

A Corrective Action Plan has been developed to address the 10 findings and LBNL's and UCOP's leadership is fully committed to implementing them in FY 2010 and beyond.

Appendix A
Status of FY 2008 Self-Assessment Institutional
Opportunities for Improvement
as of January 21, 2010

Opportunity for Improvement	CATS/ HSS ID	Status	Action Taken
Division Self-Assessment and Management of Environment, Safety, and Health (MESH) reviews identified gaps in understanding and awareness of the principles of Integrated Safety Management (ISM).	CC-2	In process	Addressed through Health, Safety, and Security Corrective Action Plan (HSS CAP).
Some divisions did not update their ISM plans consistent with changes to PUB-3000.	C-4	In process	Addressed through HSS CAP.
Existing methods to communicate PUB-3000 revisions to all levels of division line and safety management are inadequate. Furthermore, divisions need improved direction on required modifications to division ISM plans.	C-4	In process	Addressed through HSS CAP.
Some divisions cited less-than-full compliance with division walkaround requirements.	D-1	In process	Addressed through HSS CAP.
Memoranda of Understanding (MOUs) for safety responsibilities are less than adequate.	CC-2	In process	Addressed through HSS CAP.

Opportunity for Improvement	CATS/ HSS ID	Status	Action Taken
Not all affected staff members have a current Job Hazards Analysis (JHA).	C-1	In process	Addressed through HSS CAP.
Use of the institutional systems to document hazards is less than adequate.	C-1	In process	Addressed through HSS CAP.
The Facilities/EH&S/customer division planning processes need improvement (B76 furniture, B71 labs, User Support Building (USB) soil, etc.).	7603	Open	1- EH&S will hire a dedicated Subject Matter Expert (SME) for Facilities project review (due 10/1/09). 2- EH&S will review and revised support team roles and responsibilities (due 1/1/10). 3- EHS will train affected staff (due 4/1/10).
The EH&S ventilation database is not current.	C-2	In process	Addressed through HSS CAP.
Less-than-adequate completion for required online Remedy Interactive ergonomics training.	7600	Completed	1. JHA and Remedy databases linked to prompt and track EHS0059 training for targeted population 2. Provide Ergo Advocates access to Remedy interactive for their divisions.
Some divisions are not tracking safety deficiencies in the Corrective Action Tracking System (CATS).	D-2	In process	Addressed through HSS CAP.
Not all asbestos in-place locations, such as those with asbestos concealed under floor tiles and linoleum, are identified in the Hazard Management System (HMS).	7601	Open	(1) EH&S Asbestos Subject Matter Expert (SME) will enter locations in HMS where asbestos building material has been concealed (e.g., covering asbestos floor tiles). EH&S will revise the Asbestos Management Program procedures in PUB-3000 (completed 8/8/09).

Opportunity for Improvement	CATS/ HSS ID	Status	Action Taken
			(2) Facilities will revise procedures and inform EH&S asbestos SME whenever Facilities performs asbestos encapsulation during independent flooring projects other than Small or Capital Projects. When asbestos encapsulation is part of a Small or Capital Project where an EH&S team is assigned to it, the EH&S team will be responsible to identify and notify EH&S Industrial Hygiene Group that encapsulation is occurring (due 10/31/10).
EHS0735/738 <i>Blood-borne Pathogen Training</i> and EHS0745 <i>Hepatitis B Medical Surveillance</i> are linked requirements in the JHA system as of mid-2008, but some training profiles that were completed early in the JHA implementation do not show EHS0745 as a required course when EHS0735/738 is required. But workers required to take EHS0745 have typically taken EHS0745, even if it is only listed as an “extra” course on their profile.	C-1	In process	Addressed through HSS CAP. This administrative problem with linking EHS0735/738 and EHS0745 is covered by a CATS item 5871-5 to link training requirements in Biological Use Authorizations (BUAs) to the training database system.
Technical Assurance Program (TAP) assessments identified inconsistent Chemical Hygiene and Safety Program implementation.	E-1	In process	Addressed through HSS CAP.
Less-than-adequate population and maintenance of chemical container data in the Chemical Management	E-1	In process	Addressed through HSS CAP.

Opportunity for Improvement	CATS/ HSS ID	Status	Action Taken
System.			
Hazards Management System (HMS), and the EH&S Summary Report it generates, do not contain confined-space hazards.	7615	Overdue	Although HMS contains confined-space hazards, Maximo doesn't. LBNL will update the HMS-Maximo interface screen and supporting code to allow the selection of confined-space hazards as an option for transfer and ensure this hazard option is selected for transfer (due 10/30/09).
Crane managers are not adequately identified.	7602	Completed	Identify all the crane managers.
The number of electrical shocks, improper use of Lock Out/Tag Out (LOTO), and the failure to comply with minimum OSHA requirements for electrical safety indicate that the LBNL electrical safety program is not achieving its purpose.	3175	Open	16 Corrective actions are in place (CATS#3175) as a result of FY 2007 Self Assessment. Three of the corrective actions were completed during FY 2009, two remaining open corrective actions will be completed in FY 2010 and FY 2012, respectively.
TAP assessments of laser Temporary Work Authorizations (TWA) revealed that the format of the Laser TWA form did not capture all of the information required by PUB-3000, Chapter 6. This was corrected during the performance year.	7610	Completed	To meet PUB-3000 Chapter 6 requirements, LBNL's Laser Safety Officer (LSO) will modify the laser TWA form to require signature of PI's division director (or designee) besides those of the LSO and the PI.
Some of the TWAs were incomplete. Feedback from some LBNL divisions	C-1	In process	Addressed through HSS CAP.

Opportunity for Improvement	CATS/ HSS ID	Status	Action Taken
indicated that some of the TWA elements were difficult to implement.			
BSO informed LBNL EH&S management that the Laser Safety Protocols on the laser safety Web page are considered deviations from the ANSI Z136.1-2000 Standard, and that they must approve these controls as they retain Authority Having Jurisdiction (AHJ) for laser safety at LBNL.	7604	Completed	LBNL will block the link to Laser Safety Protocols Web page and submit the Protocols to BSO for review and approval before activating the Web page. (As a result of 2008 DOE Laser Safety audit, LBNL Laser Safety Program was granted the status of AHJ. BSO approval of the protocols was no longer required.)
Eight laser-interlock systems in use at LBNL do not meet life safety code requirements.	7605	Completed	The LBNL LSO will inspect the eight laser-interlock systems and ensure that they meet life safety code requirements.
Lead worker training is not required on an annual basis, which is not consistent with the 10CFR851 and OSHA requirements. This was corrected during the performance year.	7613	Completed	LBNL's training database updated to reflect 10CFR851 and OSHA requirement for annual lead worker training.
An analysis of the quality of accident reports determined that nominally 20% of all injury reports were inadequately completed and were of little to no value in supporting the performance monitoring and review	D-3	In process	Addressed through HSS CAP.

Opportunity for Improvement	CATS/ HSS ID	Status	Action Taken
process.			
There are employees who belong to an exposure group (as identified in their JHAs) but are not included in the Hearing Conservation Program (HCP). In some cases, this condition is justified but not documented.	C-3	In process	Addressed through HSS CAP.
There are employees who belong to an exposure group (as identified in their JHAs) and have not taken EHS0285 <i>Noise Exposure Hearing Test</i> . In some cases, this condition is justified but not documented.	C-3	In process	Addressed through HSS CAP.
The OIIRR process lacks a written procedure. The written procedure was finalized and referenced in PUB-3000 in October 2008.	D-3	In process	Addressed through HSS CAP.
Pre-use inspection of two Powered Industrial Trucks (PITs) located at the LBNL warehouse in Richmond had not been conducted per requirements.	7606	Completed	Facilities will conduct and record in a log all pre-use inspections of PITs located at the LBNL warehouse in Richmond as required.
Six PIT operators had expired licenses, and three had actually operated PITs without current	7607	Completed	Any operator with an expired license will not be permitted to operate PITs.

Opportunity for Improvement	CATS/ HSS ID	Status	Action Taken
licenses.			
Quality Assurance requirements for internal dose calculation software validation and verification and internal dose calculation independent review are not documented.	7608	Completed	Revise appropriate procedure to include internal dose calculation spreadsheets.
Procedures do not adequately address the evaluation process and documentation of all potential radiological monitoring needs.	C-3	In process	Addressed through HSS CAP.
Satellite Accumulation Area (SAA) compliance is less than adequate.	7609	Overdue	<ol style="list-style-type: none"> 1. Review SAA policies and procedures to ensure that regulatory requirements are met (Note: This is a subset of the actions being done for the HSS CAP corrective action CC-1) (due 9/30/09). 2. Develop recommendations for affected division directors for improving their SAA compliance (due 11/15/09).

Appendix B

FY 2009 Self-Assessment

Institutional Findings

Findings

F 1-1. In some instances, equipment purchased through Procurement created safety issues. Specific concerns include:

- Electrical equipment purchased through Procurement does not always meet Nationally Recognized Testing Laboratories (NRTL) requirements.
- LBNL Procurement may not be aware of procured items that create hazards due to poor manufacturing. One example was an unstable server lift extension used by the IT Division.

F 1-2. An update to the Institutional Integrated Safety Management (ISM) Plan was drafted, but was not finalized and implemented. Consequently, the guidance provided to divisions to update their divisional plans was in draft form and never finalized. Therefore, divisions were not properly instructed on when to update their plans or what to include in the updates (e.g. new policy).

F 1-3. Clear and formalized institutional expectation regarding ongoing oversight of employees during on-the-job training was not provided. Notwithstanding the widespread use of OJT, clear and formalized expectations for the “competency expectations” to be demonstrated were not consistently evident. This was especially true when a Job Hazards Analysis (JHA) was the governing work authorization document.

F 1-4. In several of the areas visited, work requires movement of large pieces of equipment and/or storage of material at height. There was neither a consistent approach to moving such equipment and materials, nor evidence that training had been provided.

F 1-5. Ownership of the management and the responsibility for assurance of safety of filling stations for dewars was unclear. Local organizations appeared to be taking on activities that might normally be viewed as the province of a Maintenance and Facilities function.

F 1-6. There does not appear to be an overarching set of institutional expectations regarding the conditions under which personnel should be working alone.

F 2-1. Current JHAs did not fully identify the hazards associated with the work to be performed nor did they consistently contain the Work Group Description of Work for the appropriate work group. Specific concerns include:

- Current JHAs do not fully identify the hazards associated with the work. The complete identification of hazards arising from chemical use requires the further development of an Exposure Assessment program.

- Job Hazard Assessment profiles do not consistently contain the Work Group Description of Work for the appropriate work group.

F 2-2. Safety walkarounds are not being performed as required in division ISM plans. Deficiencies include not performing per required frequency and not documenting as required.

F 2-3. Hazards are not documented as required, as use of the Hazard Management System is inconsistent.

F 2-4. The relative safety oversight roles and responsibilities of the area safety lead and work lead functions were not consistently understood. This represents a vulnerability when the PI is not consistently resident in the laboratory; or has not assured that the work lead has been vested with and can demonstrate responsibility for monitoring work, assuring work is performed consistent with the authorization process, and recognizing and communicating any changes in hazard profile to the PI.

F 2-5. With one exception, a traceable and rigorous process for systematically evaluating hazards and applying controls for unsupervised off-site (i.e., outside) projects has not been implemented.

F 3-1. The Activity Hazard Document (AHD) development process is not timely due to database limitations and availability of EH&S staff. Specific concerns include:

- Division PIs and safety leaders are unclear regarding how to properly implement the AHD process due to difficulties in using the AHD database. Particular database issues include difficulties with training information, employee records, and course listings.
- Maintenance of AHDs is susceptible to database usability problems and availability of support from EH&S Subject Matter Experts.
- The time required to authorize and maintain AHDs is dependent on the availability of EH&S Division reviewers. For example, three pending AHDs have been out for review for 1.5, 2, and 6 months, respectively.

F 3-2. Development of the AHD system addressing electrical hazards was not completed during FY 2009. This resulted in several instances of unfinished Electrical AHDs for work involving exposures to less than 50 volts and 5 milliamps. Current authorizations to work with electrical equipment are general in nature and based on a description of work in an employee's JHA.

F 3-3. Highly symptomatic individuals and subgroups of at-risk employees with prior ergonomic evaluations for discomfort exchanged their ergonomic desks and chairs for new laboratory standard furniture. This furniture was not properly fitted for all employees and three such cases became classified as recordable injuries. In addition, there were other problems with old Steelcase and Haworth furniture that didn't always fit or function well in new spaces allocated for them.

F 3-4. Training courses were not consistently offered with sufficient frequency to support operational demands. Examples include:

- Though LBNL line managers are required to complete EHS027, the course was suspended during FY 2009. Therefore, divisions couldn't comply with this requirement.

- LBNL does not offer training for Fire Extinguisher Use and Blood Borne Pathogen training at a periodicity or class size to ensure timely completion of training.

F 3-5. Chemicals are not managed as required.

- The Chemical Management System is not used as required.
- Chemical ownership and line management responsibility for chemical management/maintaining inventories have not been resolved.
- Management of peroxidizable chemicals in UC Berkeley laboratories is inconsistent.

F 3-6. Supervisor safety walkaround training is not being completed as required.

F 3-7. Notwithstanding the widespread use of on-the-job training, clear and formalized expectations for the “competency expectations” to be demonstrated were not consistently evident. This was especially true when a JHA was the governing work authorization document.

F 4-1. Compliance with Satellite Accumulation Area (SAA) program requirements is inconsistent.

- Prevalent SAA noncompliances, such as unlabeled bottles and debris in SAA tray
- In some instances, waste is left by departing groups or individual researchers without proper characterization.

F 5-1. LBNL did not provide adequate guidance to divisions to evaluate compliance with applicable environmental permit requirements.

F 5-2. Divisions are not tracking safety findings as required.

- Not all applicable findings are being entered into the Corrective Action Tracking System (CATS), especially findings from safety walkarounds.
- Timeliness of entering items into CATS also needs improvement, as some findings are not entered into CATS within five days of discovery.

F 5-3. Supervisor Accident Analysis Reports (SAARs) are not consistently completed as required.

- SAARs are not always completed within the seven-day time requirement.
- Some older SAARs had not been released as required.

F TAP 1. Institutional Unresolved Safety Issue (USI) procedures have not been promulgated at all LBNL accelerator facilities.

F TAP 2. The JHA system does not currently include aerial lifts, and affected workgroups must manually address hazards and controls. While this could be compliant, the ad-hoc supervisor JHA input has been documented to leave out the requirement for *Fall Protection Training* (EHS0276) in conjunction with aerial lift operations.

F TAP 3. Log sheets for two emergency generators showed run times exceeding allowable permit conditions.

F TAP 4. Some Facilities crafts employees who may occasionally perform work that may disturb building materials that contain asbestos lack required OSHA Class III asbestos training.

F TAP 5. The B77 abatement subcontractor performing work for the B77 Mechanical Upgrade Project did not meet OSHA and LBNL asbestos work practice and air sampling requirements.

F TAP 6. References in the Chronic Beryllium Disease Prevention Program (CBDPP) are not current. Also, the CBDPP did not address all of the requirements established in 10CFR850 elements.

F TAP 7. Beamlines designated as Biosafety Level 2 (BL2) containment work areas did not have:

- Proper access control, nor were posting requirements completely implemented per the Biological Use Authorization (BUA)
- Proper labels posted on a biohazardous waste container and an incubator where biological materials are processed per the BUA
- A sink for handwashing

F TAP 8. Training deficiencies:

- Training requirements and courses completed on two JHA training profiles were not consistent with person-specific training requirements noted on the BUA.
- A review of training profiles for workers listed on a Biological Use Registration (BUR) indicated that training was incomplete for nine of the 13 workers.
- A review of training profiles for workers listed on BUAs indicated that training was incomplete for a majority of workers.
- Training requirements and courses completed on four Job Hazard Analysis training profiles were not consistent with person-specific training requirements noted on the BUA.

F TAP 9. BUA requirements noncompliances:

- No lab coat laundry service was provided in a BL2 containment work area per National Institutes of Health and Centers for Disease Control BL2 containment criteria. Also, cloth lab coats in several BL2 containment work areas were reportedly thrown away and not cleaned.
- Hand soap dispensers were not present at the sinks in two laboratories per requirements of the BUA.
- Chairs used during laboratory work involving handling of human cells were not covered with material that can be easily cleaned and decontaminated using disinfectant, per the BUA.
- A flow cytometer equipped with a Buffalo Filter Aerosol Evacuation System was in use but not covered by a BUA or BUR. In addition, the evacuation system's Ultra Low Penetration Air Filter was found to be under a recall and had not been tested and certified.

- Employees working under BUA B079 were not informed about specific risks and health recommendations related to working with HIV lentiviral vectors.
- The location and quantities of toxins stored in a laboratory were not entered into the Chemical Management System. Bar codes were not present on the toxin containers as required by the BUA.

F TAP 10. The Hazards Management System and the EH&S Summary Report it generates do not contain confined-space hazards.

F TAP 11. One dosimetry technician's training qualifications had lapsed for the following EHS30S procedures: 370, 371, 373, 386, 387, 388, and 389.

F TAP 12. Not all divisions completed the LBNL 2008 annual Lock Out/Tag Out (LOTO) review/inspection as required by PUB-3000, Chapter 10, Section 18.15, *Periodic Inspections*.

F TAP 13. A subcontractor struck a live conduit, resulting in work stoppage on the Seismic Phase 2 project.

F TAP 14. Electrical cords were found damaged, plugged into nonconstruction-approved devices, daisy-chained, missing ground pins, in unprotected runs, and improperly used in construction sites.

F TAP 15. Quarterly inspections and flow testing of sampled Emergency Eyewash and Safety Showers (EESS) units were not consistently carried out per established frequency. In addition, some EESS units provided marginal distribution of water and two were incapable of flushing both eyes simultaneously. Absence of a flow restrictor in an EESS unit shower caused very low flow and distribution through the eyewash nozzles.

F TAP 16. The Facilities database containing EESS unit locations was not up to date.

F TAP 17. Fifty percent of eyewashes evaluated were installed in an offset manner that would prevent simultaneous use of the eyewash and shower per referenced standards.

F TAP 18. Emergency contact information for the Fixed Treatment Unit (FTU) technician was not available at the site nor was it included in the Contingency Plan.

F TAP 19. The current version of the B67 FTU Monthly Maintenance & Calibration Procedure and the B67 FTU Monthly Checklist, respectively, were not in use.

F TAP 20. The B77 FTU inspection schedule did not include the frequency of calibration of 1) the pH and the ORP probes and 2) the water-flow meter. Set points for pH and ORP probes were not documented in a procedure.

F TAP 21. The newest version of PUB-3000 Section 16.5.3, Laser Alignment and Beam Manipulation, requires the LSO to complete the Alignment Eyewear Authorization Form (Appendix C) if laser alignment eyewear is allowed. The use of this form has not started yet or been applied to existing AHDs that allow alignment eyewear but do not call for the form.

F TAP 22. ANSI Z136.1–2000, Safe Use of Laser Standard, Section 4.6.4 requires that a blocking barrier, screen, or curtain that can block or filter the laser beam at the entryway shall be

labeled with three threshold limit and exposure times and the beam exposure conditions under which protection is afforded. Not all such barriers are labeled at this time.

F TAP 23. Administrative conditions were identified. These included: 1) one improperly filled out Administrative tag was discovered at a Building 71 construction project; and 2) a construction manager requested an extension on a permit that had expired before the work began. It was noticed that a 480-volt source was not identified in the original review of the permit.

F TAP 24. Seven process-related procedural conditions were identified. These included: 1) one disconnect found not to be locked out due to an insufficient equipment-specific LOTO; 2) an employee who did not attempt to restart the equipment after the LOTO was applied; 3) a Preventative Maintenance Technician who did not have his phone number on his LOTO tag; 4) a LOTO briefing that was inadequate; 5) an equipment specific procedure that did not match the work being done; 6) incorrect application of the “live-dead-live” procedure; and 7) safety standby did that not have a nonconductive object in case electrician became “hung up” on the circuit.

F TAP 25. One Personal Protective Equipment (PPE)-related procedural condition was identified. This included an LBNL electrician getting ready to switch a 480 breaker with a top button unbuttoned and keys dangling off a belt loop.

F TAP 26. During FY 2009, there were five machine tools found without required debris shields.

F TAP 27. Lack of required guards was observed. These included: 1) three employees using machine tools without guards; 2) 12 unguarded pinch/nip points; and 3) eight unguarded points of operation (other than entanglement and pinch/nip points identified above).

F TAP 28. Employees who belong to an exposure group (as identified in their JHAs) were not included in the Hearing Conservation Program (HCP). Therefore, they have not taken EHS0285 (*Noise Exposure Hearing Test*).

F TAP 29. Implementation of Non-Construction Safety Assurance Program process steps was less than adequate for a scope of work. LBNL identified safety deficiencies requiring the work to be stopped and an Occurrence Report was submitted.

F TAP 30. Completion of some Subcontractor Job Hazards Analysis and Work Authorization (SJHAWA) forms was less than adequate. During the assessment period, some of the SJHAWAs reviewed lacked signatures, work hazard ratings, dates, responses to all questions, and adequate descriptions of the work.

F TAP 31. Information gathered during the program’s safety assurance processes indicated that safety performance by some subcontractors was less than adequate.

F TAP 32. RWA (Radiological Work Authorization) 1020 was found to have a small number of low-activity (nCi and below) items that were not listed on the inventory. These items must be characterized by the PI and added to the Heavy Elements Research Laboratory (HERL) inventory.

F TAP 33. Specific instances were identified during the site-wide confirmatory inventory that were inconsistent with the inventory-control requirements necessary to satisfy requirements of DOE STD 1027 CN1.

F TAP 34. Some injury reports (supervisors and liaisons) are submitted late, with incomplete data, and/or not at all.

F TAP 35. The Occupational Injury and Illness Reporting and Recordkeeping Program document requires notification of the EH&S Division Director and Berkeley Site Office every time the OSHA log is updated. It is noted that updates occur approximately once a month and therefore the program procedure requirement is not met. The notification requirement should be restated in a manner that is practical and that can be met reliably.

F TAP 36. Some users did not receive specific PPE training as required by 29CFR1910.

F TAP 37. Training programs for certain types of PPE (head, eye, hand, foot, skin protection) are not available. Training should include how to select PPE, how to don and doff PPE, limitations of PPE, maintenance, storage, and/or disposal.

F TAP 38. During FY 2009, there were five cases where PPE was not used as authorized.

F TAP 39. There is no documented evidence of the Radiation Protection Group (RPG) approving procurement of sealed sources as required by EH&S 711, Sealed Source Program.

F TAP 40. The language within PUB-3000, Chapter 21 (*Radiation Safety*) and RPG procedures was found in several instances to be contradictory.

F TAP 41. There is no validation of JHA completion prior to training or fit-testing of respirator wearers.

F TAP 42. Flammable liquids were stored in inappropriate containers, and deficiencies were found in signs and labels.

F TAP 43. Three hundred and ninety-nine waste-storage areas were inspected and 78% were found to be in compliance with LBNL policies and regulations. The most prevalent area of noncompliance was in the category of SAA signs and labels. Flammable-waste storage practices also emerged as an area of noncompliance.

F TAP 44. A cooling tower release and a petroleum spill adsorbent were not cleaned up as required.

F TAP 45. The Storm Water Pollution Protection Plan did not identify a specific responsible person, specific training dates, and a five-year record-retention period.

F TAP 46. Tank and drum storage areas were not inspected and documented as required by Facilities and EH&S procedures. Underground storage tank operating procedures were not current.

F TAP 47. Ventilation system surveys were not completed per the requirements outlined in PUB-3000, Section 4.6. Specifically, some systems in the Ventilation Database were shown as past due (three months beyond nominal due date).

Appendix C

FY 2009 Self-Assessment Divisional Noteworthy Practices

Division	Noteworthy Practices
Accelerator and Fusion Research Division (AFRD)	<ul style="list-style-type: none"> • Each program head is responsible for attending in-person meetings with program staff to discuss the requirements for supervising guest scientists and visitors. • Division management, supervisors, and other key individuals designated by their program heads participate in Quality Assurance/Improvement and Environment Safety, and Health through Self-Assessment and Teamwork (QUEST) walkthroughs of work areas, as described in the Supervisor Safety Plans. The QUEST program includes the observation of work behavior. • Electronic Corrective Action Tracking System (CATS) reports are sent monthly to both the program heads and program ES&H coordinators to facilitate follow-up of open and overdue items. • Informal “generator assistance” walks are conducted several times during the year with the EH&S Generator Assistant to answer generators’ questions and identify deficiencies in need of correction.
Advanced Light Source (ALS)	<ul style="list-style-type: none"> • Corrective action tracking is performed by the EH&S Administrator to assure quality of entries, assignment of responsibilities, and timeliness of closure. • Job Hazards Analyses (JHAs) are written specifically to aid staff in understanding their scope of work (boundaries). Emphasis is placed on the analytical process of workers and supervisors, identification of work and associated hazards, and appropriate controls. • The Division sponsored a workshop that was attended by representatives from all DOE Light Sources. The purpose of the meeting was benchmarking current user-safety systems, identification of common issues, and identification of best practices. • The Division employs a multitiered approach to its Integrated Safety Management (ISM) plan. Level-specific processes have been developed for the facility, beamline, user, and staff levels. In effect, the Division does not employ a “one size fits all” approach. • The Division has a Staff Safety Committee charged with investigating all adverse and near-hit incidents at the ALS, recommending corrective actions to prevent recurrences, advising regarding safety policy,

Division	Noteworthy Practices
	<p>monitoring follow-up to ensure corrective actions are properly managed, and disseminating safety-related information to employees and users.</p> <ul style="list-style-type: none"> The Division posts Lessons Learned and provides a display case containing near-hit and precursor exhibits. The bulletin board provides a visual reminder for people to be more mindful and to think about safety before starting a task, no matter how routine the task is. Web links to the ALS Safety Web site and the laboratory-wide Lessons Learned database are posted, and viewers are urged to contact the ALS EH&S Administrator if they have Lessons Learned to share.
Chemical Sciences Division (CSD)	<ul style="list-style-type: none"> The Division requires Principle Investigators (PIs) to complete a Chemical Sciences Division Project Hazard Guide at the time of submission of 1) annual Field Work Proposals and/or 2) Formal Requests for Funding Proposals. Documentation is reviewed by the Division Director and the Division Safety Coordinator. Satellite Accumulation Areas (SAAs) are reviewed quarterly by a team comprising the Division Safety Coordinator, a representative of the Waste Management Group, and the “owner” of each SAA.
Computing Sciences (CS)	<ul style="list-style-type: none"> CS created guidance documents on completing and approving the JHA. This guidance, which includes screen shots, is posted on the CS Safety and Health Web site. National Energy Research Scientific Computing (NERSC) Center posts completed Subcontractor Job Hazards Analysis (SJHA) forms to the internal NERSC TWiki, making them accessible to all NERSC staff. Energy- and waste-reduction efforts: 1) A vendor installed monitors at the Oakland Scientific Facility (OSF) computer room to assess energy-reduction options; 2) reducing paper usage; 3) purchasing Energy Star certified refrigerators; and 4) establishing a policy at the OSF that all batteries purchased must be rechargeable. Ergonomic initiatives: 1) CS developed an instruction for accessing Remedy and other online training; 2) the CS Move Coordinator is an ergo advocate and alerts the Safety Coordinator of any ergo issues related to moves; and 3) Division-specific training addresses ergonomic issues. CS customized and used the Engineering Division-developed walkaround database.

Division	Noteworthy Practices
Directorate/Ops	<ul style="list-style-type: none"> • A FY 2008 Divisional finding was that the Dir/Ops completion of Remedy Interactive was not at 100% and some organizational groups were below 80%. The Dir/Ops completion rate improved to 99% (418 of 422 employees) at the end of FY 2009. The Division has reduced its ergonomic rating “high risk” levels by 82% and reduced the “discomfort” levels by 39% during FY 2009. • The Division ergonomics program has improved. More evaluations were performed, response time was faster, and corrective actions were implemented more quickly than in FY 2008. • Remedy Interactive is a guide for employees to encourage ergo adjustments and improvements over a 30-60 day period for a stationary workforce. This is too slow for the mass move the Division encountered during the move from B937 to the hill, and Bldg. 69 to Bldg. 76. The organization addressed and coordinated the pre-move to avoid injuries.
Environmental Energy Technologies Division (EETD)	<ul style="list-style-type: none"> • EETD has established a pilot program of recording and analyzing near-hits in order to strengthen the feedback and improvement core function of ISM and identify possible patterns in the safety risks and deficiencies that need to be addressed to prevent accidents and injuries. • EETD has developed a master research facility overview spreadsheet that lists building and rooms, responsible persons, formal authorizations, a hazard summary, a primary issue summary, and various self-assessment data. This is an invaluable tool to support all five ISM Principals in the Division safety program. For example, this facility overview and the associated hard filing system facilitates capturing changes in work scope that may affect formal authorizations, and helps us stay on top of the more important issues in the labs and that supervisors report all near-hits to the Division Safety Coordinator.
Engineering Division (ENG)	<ul style="list-style-type: none"> • Line management notifies Division employees of material updates to the Division ISM plan using Engineering’s required online course, ISM 101. • Engineering designed and implemented an online database to record walkaround dates, locations, and observations. This data will be used to implement Division-specific walkaround performance measures. At least one other division is emulating this program.

Division	Noteworthy Practices
Environment, Health, and Safety (EH&S)	None identified.
Earth Sciences Division (ESD)	<ul style="list-style-type: none">• The ESD Safety Coordinator submits a quarterly ES&H report to Division management and the Safety Committee. This report summarizes the main ESD ES&H activities, incidents, authorization, training and JHA completion, Off-Site & Environmental Protection Plans (OSSEPP), Ergo evaluations, and CATS activity.• The Geochemistry Department head distributes summaries of the weekly Division Council meeting to all department members and requests input. He emphasizes safety as the first item in these communications.• DOE BSO Verification and Validation Effectiveness Review auditors identified a noteworthy practice, the ESD inspection log of the labs, which is used to document the monthly Labspace Lead Principle Investigator (LLPI) walkthrough.
Facilities (FAC)	<ul style="list-style-type: none">• The Division developed a “spot award” program to encourage the reporting of near-hit incidents. Included in the program is the prominent posting of employee submittals in the central Division break area.• The Division implemented a Division Zero Accident Council (DZAC) designed to engage staff in sharing and examining safety and health issues. Council membership includes Division representatives who attend Council meetings and provide feedback to the employees whom they represent.

Division	Noteworthy Practices
Genomics (GN)	None identified.
Information Technology (IT)	<ul style="list-style-type: none"> • IT worked with Facilities to clean up all IT space-related incorrect data in Maximo. • Energy-reduction efforts in the 50B-1275 data center: converting false ceiling into a hot-air return for the AC units, increasing the AC units' temperature set point, disabling unnecessary humidification and dehumidification functions or AC units, installing curtains to improve air-flow management. • Developed a video to explain confined-space work and appropriate application of confined-space work permits. Posted video on IT Web site. • Developed workspace safety metrics for all IT workspaces. This practice allows IT to focus on locations that are systematically underperforming compared with other IT workspaces.
Life Sciences Division (LSD)	<ul style="list-style-type: none"> • The Division requested in-lab interviews between staff and representatives of the McCallum-Turner Group to strengthen staff's understanding of its role in applying the five elements of ISM into daily work.
Materials Sciences Division (MSD)	<ul style="list-style-type: none"> • The Division has initiated a hiring process that withholds issuance of badges to new hires and guests until they have completed drafting their JHAs and General Employee Radiological Training (GERT). • All scientific work in Molecular Foundry spaces must be approved via a proposal review process that screens the proposals for scientific importance, feasibility, and MSD ES&H concerns. The EH&S Manager approves the proposal only when all identified issues have been evaluated. Work cannot begin until approved by the ES&H Manager. • Division scientists notify the ES&H Manager prior to purchase of equipment that may introduce new hazards or a new scale of an existing hazard. The need for personal protective, engineered, and administrative controls developed accordingly.

Division	Noteworthy Practices
	<ul style="list-style-type: none"> • The Division, with the assistance of the EH&S Division, is developing video-based training to address the identification of engineered controls for small lab operations. Eventually, this class will be required for all lab researchers in the Division. • For internal reauthorization, Division PIs are required to verify that the work has not changed significantly before rerouting an Activity Hazard Document (AHD) or Biological Use Authorization (BUA) for renewal. The EH&S Manager reviews the AHD or BUA during the reauthorization process to identify any changes that warrant a full review. • The Division conducts inspections of LBNL SAAs three times per year. The inspections are conducted by a Division representative along with representatives from the EH&S Division and BSO. SAAs are also inspected as part of the annual Division inspection conducted by the PI and the EH&S Manager along with semiannual inspections conducted by the Division ES&H Technician. • The Division has implemented an alternative to the EHS0027, <i>Performing an Effective Safety Walkaround</i> class. PIs are trained in effective safety walkaround inspections during their annual inspection with the EH&S Manager and with the annual inspection with the Division ES&H technician.
Nuclear Science Division (NSD)	<ul style="list-style-type: none"> • The HSS Emulation review noted that the B88 Machine Shop and B88/134 are notable examples of clear and consistent control of shop and laboratory space (respectively), authorization of work, and management of external personnel (students and users) who used equipment in those shop and laboratory areas.
Physics Division (PD)	<ul style="list-style-type: none"> • A Vertical Slice Questionnaire is used to periodically gauge the knowledge and attitude toward safety within the Division. This process directly addresses ISM Core Function 5 and provides valuable insight into the effectiveness of the Division's safety program, including opportunities for improvement. • The B50 Machine Shop and B50-2161 were identified during the HSS Emulation as notable examples of clear and consistent control of shop and laboratory space (respectively), authorization of work, and management of external personnel (students and users) who used equipment in those shop and laboratory areas. • The Division implemented a Near Hit program that seeks to identify and document issues before they result in injuries. Employees are recognized for bringing issues to the attention of management.

Division	Noteworthy Practices
Physical Biosciences Division (PBD)	<ul style="list-style-type: none">• JHA completion is a prerequisite for proximity card-key access to Joint BioEnergy Institute (JBEI), Donner, and B64.• The PBD Safety Planning Team tests peroxide levels in all potential peroxide formers, including low-level peroxide formers, every October.• Injury reviews are collaborative efforts with respective UC Berkeley departments when employee injuries occur in UC Berkeley space.• PBD introduced the Bio-scientists Observing Bio-scientists program, which aims to reduce injuries by applying the principles of behavior observation and positive feedback.• PBD has developed a Safety Dashboard of vital safety metrics that the Safety Planning Team reviews regularly.

Appendix D

FY 2009 ES&H Division Self-Assessment Performance Measures

ISM CORE FUNCTION 1: DEFINE WORK

1. Division revises division Integrated Safety Management (ISM) plan to reflect a) ES&H policy changes, and b) updates to the *Institutional ISM Plan*. Line management communicates updates to the plan to division personnel and assesses effectiveness of that communication.
2. Division ensures workers have current (reviewed/reauthorized within the previous 12 months) Individual Baseline Job Hazards Analyses (JHA) that accurately reflect the work performed and hazards present.
3. Division ensures that before nonconstruction work is performed by subcontractors, vendors, or guests at LBNL facilities, a Subcontractor Job Hazards Analysis and Work Authorization (SJHAWA) form is prepared and prejob meeting is held to review and sign the SJHAWA form. Oversight of the work is performed and recorded using a risk-based graded approach.

ISM CORE FUNCTION 2: IDENTIFY HAZARDS

4. Division reviews work activities to identify, analyze, and categorize hazards and environmental impacts for the associated work. Examples of hazard inventory include: Hazard Management System (HMS) database (or equivalent), project safety review, workspace safety review, JHA, environmental review (NEPA/CEQA, permits, regulations), and chemical inventory.
5. Division participates in pollution prevention, energy and resource conservation, recycling, and waste-minimization programs, as appropriate for the environmental impact of its activities.
6. Division, with assistance from EH&S, surveys all of its electrical equipment by September 30, 2009, as required by the LBNL Electrical Equipment Acceptance Program.

ISM CORE FUNCTION 3: CONTROL HAZARDS

7. Division is using appropriate and required engineering controls in performing work.
8. Division is using appropriate and required administrative controls in performing work. Examples of administrative controls include: work authorizations (including but not limited to JHAs, Activity Hazard Documents [AHDs], Biological Use Authorizations [BUAs] and Radiological Work Authorizations [RWAs]), work permits (including but not limited to confined space, and energized electrical work), environmental regulations and permits (including recordkeeping), work procedures, and project safety reviews.

9. Division controls ergonomic hazards (computer, laboratory, and material handling). Employees and line management are knowledgeable and engaged in this process, including the early reporting of ergonomic pain or discomfort (before an injury). Ergonomic issues/concerns/discomfort/pain are managed effectively.

ISM CORE FUNCTION 4: PERFORM WORK

10. Division performs work safely within ES&H conditions and requirements specified by Laboratory policies and procedures. Performance criteria include work authorizations (including but not limited to JHAs, AHDs, BUAs, RWAs); work permits (including but not limited to confined space, energized electrical work); waste management criteria (Satellite Accumulation Areas [SAAs], waste sampling, Non-conformance and Corrective Action Reports [NCARs]); and environmental permits and management criteria (resource conservation, pollution prevention, and waste minimization).
11. Staff (including employees, participating guests, students, and visitors) is effectively trained to properly perform work. Required training is based on JHA and on-the-job training identified by the division.

ISM CORE FUNCTION 5: FEEDBACK AND IMPROVEMENT

12. Division implements an effective safety walkaround program per the requirements of the division ISM plan. Division staff conducts safety walkarounds as assigned. Safety walkaround results are effectively integrated into division self-assessments as a component of the division's feedback and continuous improvement process.
13. Division performs a thorough review of all accidents, injuries, incidents, near-hits, and concerns according to Laboratory policy and the division's ISM plan. Corrective actions to prevent recurrence are identified and effectively implemented.
14. Division shares Lessons Learned from accidents, injuries, incidents, and near-hits with Laboratory staff via the institutional Lessons Learned and Best Practices database, as appropriate. Division incorporates applicable Lessons Learned into work planning and performance processes.
15. ES&H deficiencies that cannot be resolved upon discovery are entered in the LBNL Corrective Action Tracking System (CATS) in a timely manner and tracked to resolution. Deficiencies include those from workspace inspections, self-assessment activities, Supervisor Accident Analysis Reports (SAARs), Occurrence Reports, Noncompliance Tracking System Reports, environmental inspections, division self-assessment, EH&S technical reviews, Management of ES&H (MESH) Reviews, and external appraisals and inspections.

Appendix E

List of Acronyms and Abbreviations

AFRD	Accelerator and Fusion Research Division
AHD	Activity Hazard Document
AHJ	Authority Having Jurisdiction
ALARA	As Low As Reasonably Achievable
ALS	Advanced Light Source
ANSI	American National Standards Institute
BL2	Biosafety Level 2
BSO	DOE Berkeley Site Office
BUA	Biological Use Authorization
BUR	Biological Use Registration
CAP	Corrective Action Plan
CATS	Corrective Action Tracking System
CBDPP	Chronic Beryllium Disease Prevention Program
CHSP	Chemical Hygiene and Safety Program
CMS	Chemical Management System
CS	Computing Sciences
CSD	Chemical Sciences Division
DART	Days Away, Restricted, or Transferred
dBA	Decibels (A-weighted)
DOE	U.S. Department of Energy
DOELAP	DOE Laboratory Accreditation Program
DZAC	Division Zero Accident Council
EETD	Environmental Energy Technologies Division
EFCOG	Energy Facility Contractors Group
EH&S	Environment, Health, and Safety Division
EMS	Environmental Management System
ESD	Earth Sciences Division
EESS	Emergency Eyewash and Safety Showers
ES&H	Environment, Safety, and Health
FAC	Facilities Division
FTU	Fixed Treatment Unit
FY	fiscal year
GERT	General Employee Radiological Training
HERL	Heavy Elements Research Laboratory
HCP	Hearing Conservation Program
HMS	Hazard Management System
HSS	Healthy, Safety, and Security
IH	Industrial Hygienist
ISM	Integrated Safety Management
IT	Information Technology Division

JBEI	Joint BioEnergy Institute
JHA	Job Hazards Analysis
JHQ	Job Hazards Questionnaire
LBNL	Lawrence Berkeley National Laboratory
LLPI	Labspace Lead Principle Investigator
LOTO	Lock Out/Tag Out
LSD	Life Sciences Division
LSO	Laser Safety Officer
MC&A	Material Control and Accountability
MESH	Management of Environment, Safety, and Health
MOU	Memorandum of Understanding
MSD	Materials Sciences Division
NCAR	Non-conformance and Corrective Action Report
NEPA/CEQA	National Environmental Policy Act/California Environmental Quality Act
NERSC	National Energy Research Scientific Computing (Center)
NFPA	National Fire Protection Association
NRTL	Nationally Recognized Testing Laboratories
NSD	Nuclear Science Division
OCA	Office of Contract Assurance
OHM	Occupational Health Manager
OIIR	Occupational Injury and Illness Reporting and Recordkeeping
OJT	On-the-Job Training
ORPS	Occurrence Reporting and Processing System
OSF	Oakland Scientific Facility
OSHA	Occupational Safety and Health Administration
OSSEP	Off-Site & Environmental Protection Plans
PBD	Physical Biosciences Division
PEMP	Performance Evaluation and Measurement Plan
PI	Principal Investigator
PIT	Powered Industrial Trucks
PPE	Personal Protective Equipment
QUEST	Quality Assurance/Improvement and Environment Safety, and Health through Self-Assessment and Teamwork
RADAR	Radiation Authorization Reporting System
RPG	Radiation Protection Group
RWA	Radiological Work Authorization
SAA	Satellite Accumulation Area
SAAR	Supervisor Accident Analysis Report
SJHAWA	Subcontractor Job Hazards Analysis and Work Authorization
SME	Subject Matter Expert
TAAP	Technical Assurance Assessment Plan
TAP	Technical Assurance Program
TRC	Total Reportable Case

TWA	Temporary Work Authorization
UCOP	University of California Office of the President
USB	User Support Building
USI	Unresolved Safety Issue